Pests

AND THEIR CONTROL

1942

OCTOBER

VOL. 10 NO. 10

ORGAN OF THE PEST CONTROL INDUSTRY

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Fumigators
Termite Control Operators
Entomologists
Insecticide and Supply Mfgrs.

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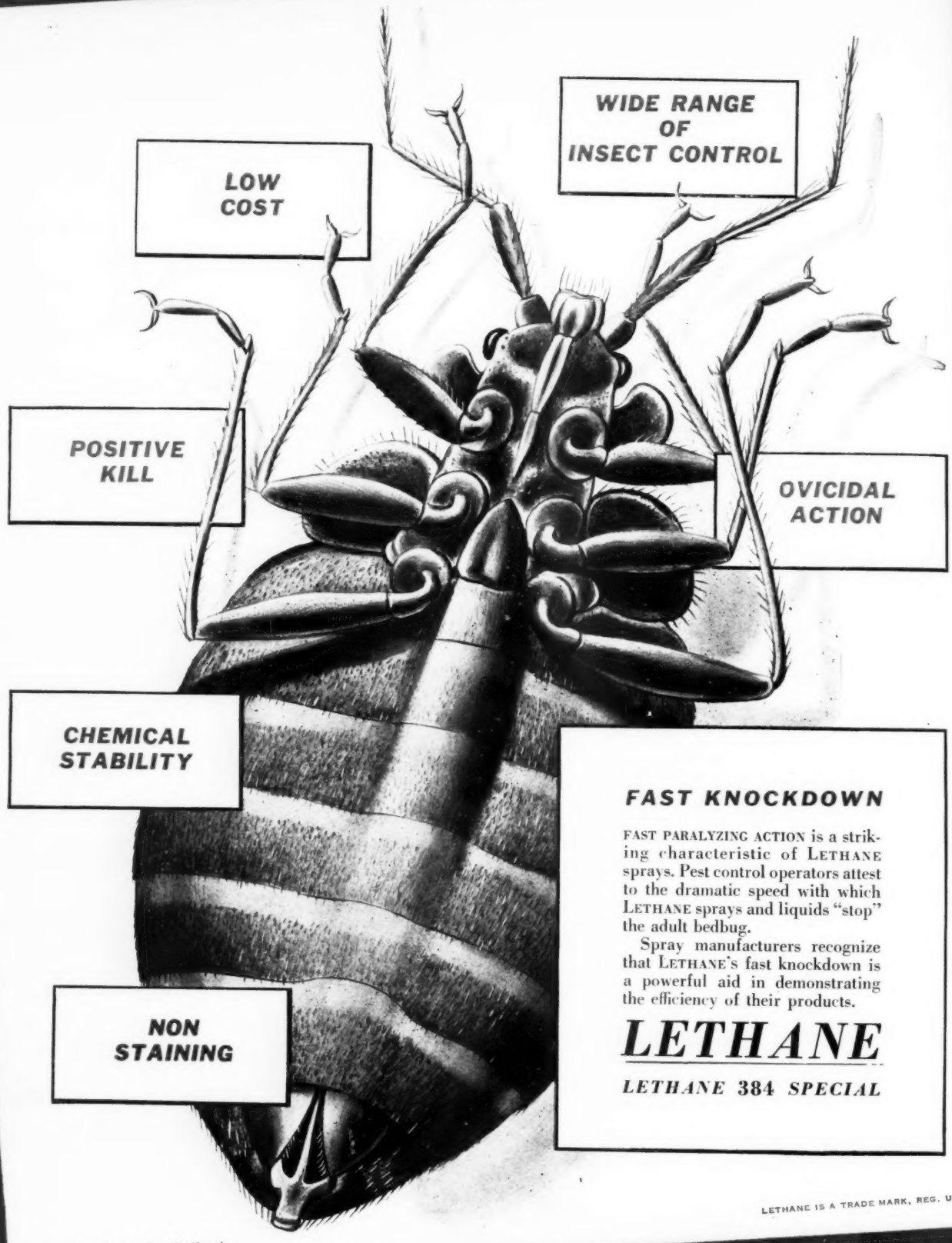

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Pests

and Their CONTROL

COOPERATING WITH NATIONAL PEST CONTROL ASSOCIATION

Exterminators, Fumigators, Termite Control Operators, Entomologists, Insecticide and Supply Manufacturers

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Three classes of membership: Active, Associated and Allied. ACTIVE MEMBERSHIP includes all firms engaged in any type of Pest Control operations (general extermination, fumigation, termite control, moth proofing) and dues are $15.00 per year. ASSOCIATE MEMBERSHIP includes branch offices of Active members and yearly dues are $10.00. ALLIED MEMBERSHIP includes manufacturers and supply houses.

STATEMENT

The National Association appreciates the co-operation given by way of publicity. The Association is not responsible for articles published unless credited to the Association. The list of officers and directors is published for informational purposes only.

For further details, communicate with

WILLIAM O. BUETTNER, *Secretary*
3019 Fort Hamilton Parkway — Brooklyn, New York

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EDITORIAL

Robert W. Laing

Mr. Robert W. Laing, 58, head of the Laing Exterminating Co., Cleveland, O., which he founded in 1921, widely known in Great Lakes shipping circles for his work done on freighters, and while apparently in good health, died suddenly on September 20, of a cerebral hemorrhage.

Born in Bedford, Ohio and moved to Seattle while still a boy, he joined the United States Army at 17 and served in the Philippines during the insurrection there. He also fought in France during the First World War as a first lieutenant and later as acting captain when his superior was killed in action.

Great lover of the outdoors, a hunter and fisherman, he had taken two fishing trips to Michigan and Canada with his son, according to his wife, Mrs. Helen Laing, because he had a premonition that they would be his last.

Mr. Laing was one of the original charter members of the NPCA, in addition to serving on several of its committees; he was also an Association director. Moreover, he was a Mason and member of the Cleveland Club.

Besides his wife and son, he is survived by two daughters, Barbara and Helen, all of whom live at the family home at 2196 Bellfield Road, Cleveland Heights, and a sister, Mrs. A. J. Gardener of Toronto.

Our sincerest condolences to Mrs. Helen ("Pat" to many) Laing and his three children, Barbara, Helen, and Robert, Jr. No doubt Mr. Laing will be sorely missed by his family and his many friends both in and outside the Industry. He was a credit to his profession and to the Industry which he always served wisely and well. Representing the Industry at the funeral services were: Bill Buettner, Bill Stover, Bill Kirschner, Larry McKenna, Al Akers, Harry Studier, Prof. J. J. Davis, Thos. Burd and George H. Chapman.—Ed.

The Most Essential NPCA Convention To Date

Unlike some other industries in the pre Pearl Harbor era, the Pest Control Industry has not only taken its conventions seriously—and rightly so—but has accomplished much of value thereat in protecting public health and food conservation. If this has been so true in the past, how much more necessary is it in the present grave emergency when factors of public health and food conservation are of utmost consequence in the war program.

There's no need to labor the obvious essentiality of the NPCA Convention to be held at the Hotel William Penn, Pittsburgh, Pa., October 26-27-28, except, perhaps, to indicate that the Convention theme: PEST CONTROL—A WARTIME NECESSITY, and the Convention program outlined elsewhere in this issue, take full and timely cognizance of the Industry's responsibility in the war picture.

And finally, the increasing spate of problems you are contending with daily, should effectively determine the answer to the question of not whether you can afford the time to attend, but whether you can afford NOT to participate in the Industry's most essential Convention to be held to date.

Message From Pittsburgh

A group of 20, including Mr. Wm. O. Buettner, have just put the finishing touches on the program for the coming convention, October 26-27-28. We in Pittsburgh feel it will be interesting to all.

The speakers' subjects have to do with the conditions as they are today and what we can expect in the next few months. Many of the speakers are taking time from their very important war jobs to relate these conditions and expectations. Surely we can all afford to give our time to COME AND HEAR what is expected of us in this emergency.

The program and entertainment will be entirely different than anything we ever had. Service letters have told you the convention will open Monday morning with the unfurling of a service flag. The convention will close on Wednesday evening with the Banquet being held in the beautiful "CHATTERBOX". The music will be furnished by nationally known Bob Astor's Orchestra. Those who care to remain can dance until 2 A. M., if they wish.

Oh, yes, don't forget the ladies. We want them all to come and enjoy themselves, meeting old acquaintances and acquiring new ones. We have had many a headache arranging their program. Many factories and buildings have been closed for the duration. Buses cannot be used for sightseeing, but we have managed to arrange an interesting program. If the ladies will bear with us and bring comfortable shoes for the little walking that will be necessary, we will take them to the famed and beautiful Civic Center. This Center has the largest building under glass in the world and it contains a rare and beautiful collection of orchids. Then there is the tallest school, The University of Pittsburgh, Carnegie Museum with its fine collection of Art, Soldiers and Sailors Memorial, and many others.

COME, SEE, HEAR, LEARN. Pittsburgh awaits you.

Correction—"Price Ceilings"

The editorial "Termite Services Exempted From Price-Ceiling Regulations" which appeared in our September issue, p. 2, was correct so far as it went, but, unfortunately, it did not go far enough. Disinfecting, exterminating, fumigating, except the fumigating of food, grain, and seeds, also properly come within the list of services exempted from price-ceiling regulations. In this connection, NPCA Service Letter No. 275 points the possibility

that certain mothproofing operations will not be exempted. Commendation is due the National Pest Control Association since it was instrumental in obtaining the favorable ruling exempting the services indicated from the price-ceiling regulations.

News and Views From "Down-Under"

PEST CONTROL being the science, the profession and the universal need that it is, it is only natural, therefore, that the NPCA's membership roster should take on an international character. Moreover, regular two-way contact, as between the NPCA and its member-affiliates, is maintained, thus making for harmonious and closer relationship all around. Of significance in this respect are some letters received by W. O. Buettner, Secretary, NPCA, from B. L. Houghton of Houghton & Byrne Pty. Ltd., Sydney, Australia, in which his logical appraisal of the lot of the PCO under war time dislocation might, in the main, geographic distances to the contrary notwithstanding, have its direct application to the American scene. Among other things, Mr. Houghton reports:

I have been watching your bulletins and letters not without some amusement on occasions because I could see where the axe was going to fall on you: I mean in petrol, callups, rubber and lots of other things, and I should say you will be much the same as we are. You will be allowed to keep managers, and possibly a few key men, especially trained fumigators because these men cannot be picked up in war time.

We find here that the Army, Navy and Air Force have made many frequent urgent calls on us for various work and they always want it done that day, and we certainly make an effort to get it done. We have had to plead with the Man Power Authorities to keep one or two key men, otherwise we could not continue, and they have given us a fair hearing.

All pest exterminators are sure to find themselves very busy these days because with labor shortage there is a laxness in hotels and apartment houses and the like and there will be more work. People will always spend money on their homes no matter what the news is or what the taxation is. At least that is what we find. We had a lady visiting here from Singapore whose husband directs a termite business, and she said that right up to the day the Japs came in they were getting 'phone calls for termite inspections.

We are doing plenty of pest control work and have many new rat contracts. Of course many firms had a handy man about the place who perhaps did these for them, and now they are so busy they are glad to have our attention. Many firms are now employing us who were hard to win over before, and in years to come they will realize the benefit of employing professional people.

DON'T FORGET IF YOU HAVE ANY PEST CONTROL MEN TURNED SOLDIERS OR SAILORS WHO ARE COMING THIS WAY THAT WE SHALL BE VERY GLAD TO DO WHAT WE CAN FOR THEM AND MAKE THEM WELCOME. FROM ALL YOUR BROAD STRETCH OF COUNTRY THERE SURELY MUST BE SOME HERE NOW AND PERHAPS YOU WILL BE ABLE TO BRING IT TO NOTICE IN YOUR MAGAZINES POINTING OUT THAT WE HAVE OFFICES IN SYDNEY, ADELAIDE AND BRISBANE AND FOR PEST CONTROL OPERATORS TO MAKE THEMSELVES KNOWN TO THE MANAGERS IN EACH CASE AND IF THEY HAVE A DAY OFF WE MIGHT BE ABLE TO GIVE THEM A "BUSMAN'S HOLIDAY." . . . The American sailor and soldier has impressed everyone by his smart appearance and behavior when on leave, and quite apart from the valued assistance it is a pleasure to see them about.

Health and Welfare Services by Army-Navy As Essential Workers

The Army and Navy issued their first list of essential workers who will not be allowed to volunteer and probably will not be drafted, according to a news item in the Journal-American, N. Y., September 12. This same source further quoted the Army-Navy announcement as saying that the list, which included health and welfare services, facilities and equipment, "also will be used as a guide by Local Selective Service Boards."

Allocation Classification Symbol for PCOs

OPERATORS of industrial and home fumigating and exterminating services have been authorized to use the symbol 12.20 on orders placed under the allocation system, as per announcement by J. D. Vail, Jr., Chief of the financial and business services section of the WBB.

NOTICE

Please notify us promptly if you should change your address. Magazines are never forwarded. If your copy of PESTS is not delivered to you by the 15th of the month, you should notify us at once.

SUBSCRIBERS

We have authorized no agents to accept your renewal. If you are a subscriber please so advise any agents calling on you. Send all renewals to Main Office, 512 East 14th St., Kansas City, Mo.

ALL - ABOARD - LET'S GO

Where?

PCO National Convention

Pest Control: a Wartime Necessity Sets Stage for
TENTH ANNUAL CONVENTION
National Pest Control Association, Inc.
William Penn Hotel—October 26-27-28, 1942

It is obvious from the NPCA Convention program, outlined herewith, and the Convention theme: PEST CONTROL: A WARTIME NECESSITY, that the perplexities confronting the Industry, and the best way in which it can be of greatest service in the war emergency, will be discussed in generous measure, with participation from the Convention floor more than welcome. Equally obvious, from the list of speakers herein, is the assurance that each topic on the agenda will be in the hands of one whose experience and grasp of his subject will enable him to offer much that the PCO will find helpful. Addressing the Convention will be speakers from War Production Board, Bureau of Entomology and Plant Quarantine, Fish & Wildlife Service, Public Health Departments, and universities, among others.

All Invited

PCOs, whether members of the NPCA or not, having a pyrethrum, rotenone, sodium fluoride, tire, tube, gasoline, termite, fumigation or any technical or business problem, as well as public health officials, entomologists, chemical and supply houses, are all cordially invited to attend the Convention. Each, undoubtedly, can contribute towards a more efficient PCI, thereby, aiding in the successful prosecution of the war.

Employees in the Armed Forces

If you haven't as yet sent the Secretary of the NPCA names of your employees in the Armed Forces with their branch of service, or those about to be inducted, please do so promptly so that proper credit may be included in the Service Flag to be unfurled at the Convention.

THEME

PEST CONTROL—A Wartime Necessity. A New Industry comes of age in time to enlist. Question-marks of the development stage now become exclamation points: A War economy demands

(a)—Protection of the Public Health
(b)—Conservation of Food and Other Vital Stores

REGISTRATION

The Registration Desk will be conveniently located, 17th floor of Wm. Penn Hotel. (See Bulletin Board.) We urge that the preliminary registration forms be filled out and returned as directed. By so doing, your badge, tickets, and other material will be waiting for you. The Registration Desk will be open Sunday afternoon and Monday from 8:30 A.M. Registration fee for every person is $7.50.

PROGRAM

Sunday Afternoon, October 25

2:00 P.M.—Informal reception at the William Penn Hotel, Suite 566-8-70. Sightseeing arranged for those desiring—Inquire at the Registration Desk.

6:00 P.M.—"Dutch Treat" dinner in the Terrace Room (make reservations in advance by writing to the Secretary, or Dick K. Clowes, Local Pittsburgh Chairman, 2449 Wedgemere Street, Pittsburgh, Penn.)

7:45 P.M.—Board of Directors Meeting—Parlors No. 1-2.

9:30 P.M.—Open House sponsored by Order of Standbys — President's Suite.

All Convention Sessions will be held in The Urban Room.

Monday Morning, October 26

Registration (8:30 to 9:30 A. M.)

Convention Called to Order at 9:30 A. M.—Louis Gatto, General Chm.

National Anthem, "Star Spangled Banner"—Miss Meriam Reader.

Invocation—Reverend J. Clyde Henry.

Unfurling Service Flag— J. Palmer.

Pittsburgh Welcomes the Convention —Mayor Cornelius D. Scully.

The Pest Control Industry Replies—Walter S. McCloud.

President's Annual Address—P. Calvert Cissel.

Secretary's Annual Report—William O. Buettner.

Treasurer's Annual Report — Albert M. Akers.

Memorial Service—H. K. Steckel.

Introduction of Distinguished Guests and Visitors—William O. Buettner.

"Pest Control From the Point of View of a Public Health Official"—Dr. I. Hope Alexander.

Committee Reports:

(Committees will include recommendations which will be introduced as motions for subsequent consideration at the business session of the Convention. As time permits, opportunity will be given to discuss some of these matters.)

"Whither in Pest Control"—Professor J. J. Davis.

Business Session and Announcements.

Monday Luncheon, 12:15 P. M.
Cardinal Room

Speaker to be announced.

Monday Afternoon, October 26
(Reconvenes promptly at 2 P. M.)

(A) Rodent Control—F. E. Bohman, Presiding.

"The Fish and Wildlife Service (Rodent Control Division) Brings Us Up To Date"—F. E. Garlough.

"Theory of Poisons and Fluorine Antidotes"—Dr. James C. Munch.

"A Permanent City Rat Control Project"—F. E. Garlough and William O. Buettner.

"Panel Discussion — Questions and Answers"—Ernest M. Mills, Leader, assisted by Martin T. Meyer, George B. Lay, M. F. Levenson, George Dyar, and Harold Kaufman.

(B) Legislation and Specifications—William O. Buettner, Presiding.

"Comments on Existing and New Legislation"—Lawrence A. McKenna, Ernest R. Barber, and L. R. Alderman.

"Specifications—Phraseology"—Morton S. Prescott.

"Phraseology for Legislative Proposals"—C. Norman Dold.

"Joint Committee Recommendations on Legislation A.A.E.E.—N.P.C.A." —Professor W. F. Flint and Dr. H. K. Steckel.

Monday Evening, October 26

7:30 P.M. — Booth Exhibitors — William O. Buettner. Manufacturers and supply houses having booth exhibits, 17th floor (Silver Room), will be introduced and some salient facts and features of the displays commented upon. Every one is requested to attend and become acquainted with the representatives of these co-operating booth exhibitors.

9:00 P.M.—The Urban Room.
Movies: "Keep 'Em Out"—a film produced by the U. S. Public Health Service on rat control. "Fumigation"—The Association Film.

Tuesday Morning, October 27
(Session Opens at 9:15 A.M.)

(A) War Production Board — Armed Services—P. Calvert Cissel, Presiding. The greater part of the morning session will be given over to a discussion of the many ramifications entering into the problem of shortage of supplies, chemicals and other equipment. A better understanding of the seriousness of the situation as it has to do with Pyrethrum, Rotenone, tires, tubes, metals, containers, etc. Opportunity will be given for an open forum.

"The Chemicals Situation" — Melvin Goldberg.

"The Plight of a Service Industry"—J. D. Vail, Jr.

"Household and Industrial Insecticide Manufacturers Advisory Committee"—William O. Buettner.

"The Control of Pests in the 6th Service Command" — Lieut. Irwin H. Gilbert.

"The Navy and Pest Control"—Harold E. Jennings.

(B) Termite Control—K. W. Harder, Presiding.

"Termite Control Investigations"—(Speaker to be announced from Bureau of Entomology and Plant Quarantine).

"Common Mistakes in Termite Treatments"—George L. Hockenyos.

"Springfield, Illinois, Termite Tests"—Mr. Berger.

"Questions and Answers" — Bert Lewis, Leader, assisted by George L. Hockenyos and Alfred Zimmern.

Tuesday Luncheon—12:15 P.M.
Cardinal Room

"Food Relations to Fumigation"—H. C. Patton.

"Relations to Plumbing Fumigations"—Thomas G. English.

Tuesday Afternoon, October 27

(Session Reconvenes promptly at 2:15 P.M.)—P. Calvert Cissel, Presiding.

(A) Entomological and Research Activities With Relation to the War Program.

"Some Unusual Calls for Help"—Dr. W. E. Dove.

"The War and Pest Control"—Probably Dr. R. C. Roark.

"American Association of Economic Entomologists"—Dr. L. M. Peairs.

"Insecticide Research"—Dr. Oscar F. Hedenburg.

(B) Fumigation Clinic — B. W. Eldredge, Leader.

"Chemical Phases of Fumigants"—Dr. John H. Foulger.

"Analysis of Accidents and Fatalities"—Lothar Vogel.

"Gas and Decontamination — Safety Practices"—E. W. Gilliland.

"Questions and Answers"—B. W. Eldredge, assisted by Max Rukin, Herman C. Militzer, Dr. George B. Chapman, C. A. Vincent-Daviss, and Conrad C. Johnson.

Tuesday Evening, October 27

8:00 P.M.—Halloween Party—The Urban Room.

Wednesday Morning, October 28

(Session Opens at 9:00 A.M.)—P. Calvert Cissel, Presiding.

(A) Business Practices — Louis Kotler, Leader.

"Analysis of Phraseology in Advertisements Appearing in Classified Telephone Directories"—John G. Vogel and Martin T. Meyer.

"Property Management and Pest Control"—R. A. MacDowell.

"Panel Discussion" — George R. Elliott, Leader.

(B) Business Session (While normally business sessions are open to members only, our Association invites all non-members to attend. Privilege is not given, however, to non-members to take part in the discussions or voting, unless invited by the Chairman.)

1. Unfinished business.
2. New business.
3. Report of Nominating Committee.
4. Election of Officers and Directors, October, 1942, to October, 1943.

Wednesday Afternoon, October 28
(Session reconvenes promptly at 2:15 P.M.)

"What Good Business-Consumer Relations Mean to You"—G. H. Dennison.

"Insects and Rodents as Carriers of Diseases"—Dr. George L. Wessels. The remainder of the afternoon will be given over to general discussion and unfinished business matters.

Wednesday Evening, October 28

6:30 P.M.—Annual Banquet—The Chatterbox.
C. Brainerd Metheny, Toastmaster.

(a) Entertainment.
(b) "The Old Timer" — Daniel Ross.
(c) Remarks by President, President-Elect, and Secretary.
(d) Dancing to the music of Bob Astor and his Sixteen Piece Band featuring Terry Russell.

LADIES' PROGRAM—Tenth Annual Convention

All ladies are invited to attend any and all Convention Sessions and booth exhibits. The permanent headquarters for the ladies throughout the Convention, Parlors E and F on the seventeenth floor.

Sunday, October 25

From 2:00 to 5:00 P.M. tea will be served, in Suite 566-8-70, of the William Penn Hotel. Men are invited to the tea.

Monday, October 26

At 11:30 A.M. the ladies will meet at Parlors E and F on the seventeenth floor and go in a body to Kaufmann's, one of our nicest department stores, where Luncheon will be served. The remainder of the afternoon will include a visit to the Gillespie Galleries, followed by Bridge, Five-hundred, Chinese Checkers, etc.

The evening is given over to a trip to the booth exhibits followed by the program arranged by the Entertainment Committee to be held in the Urban Room.

Tuesday, October 27

At 10:00 A.M. the ladies are requested to meet promptly at the Ladies Headquarters and go in a body to 5th Avenue where street cars will be waiting to take us to Oakland (Civic Center). Luncheon will be served at the Schenley Hotel. Following the luncheon, a sightseeing trip will include the University of Pittsburgh, Heinz Memorial Chapel, Stephen Collins Foster Memorial, and the Phipps Conservatory — one of the largest buildings under glass in the world—during which sightseeing will be viewed the lovely Chrysanthemums and famous Orchid collections.

In the evening at 8 o'clock—The Big Halloween Party will be held. Ladies are asked to wear costumes if possible but this is not compulsory to do. If you come as you are, you can still have fun, but be sure to come. Let's be children once again and enjoy ourselves.

Wednesday, October 28

The entire day has been left free so that the Ladies can do shopping or take such trips as they may desire. The local Ladies Committee will be

pleased to be of any assistance in helping you to make these arrangements as well as make reservations at any local beauty salons for your convenience.

In the evening at 6:30 o'clock the Annual Banquet and Dance in the Chatterbox of the William Penn Hotel. Entertainment as well as Bob Astor and his 16 piece orchestra featuring Terry Russell will make for an evening long to be remembered.

Booth Exhibits

One of the outstanding features of every convention is the Booth Exhibits. One would think that firms may not consider the value of booth exhibits because of the war but on the contrary, it is more necessary now than other times as there are new items, substitutes, shorter methods, opportunities for conferences, etc. There are several exhibits pending but at this writing, one month away from the Convention, the following will have exhibits:

Acme Safety Equipment Co.	Booth 1
E. I. du Pont de Nemours Co. (Cyanide Products Division)	Booth 2
John Powell & Co.	Booth 4
American Cyanamid & Chem. Corp.	Booth 5
The Antimite Co.	Booth 6
Associated Chemists, Inc.	Booth 7
G. L. Hockenyos, Inc.	Booth 8
Poultry-Rat-Control Demonstration	Booths 9-10
John Opitz, Inc.	Booth 13
James Good, Inc.	Booth 14
Innis, Speiden Co.	Booth 15
B. & D. A. Weisburger	Booth 17
Mine Safety Appliances Co.	Booth 18

The Poultry-Rat-Control Demonstration will be of unusual interest in that George W. Dyar of the Fish & Wildlife Service will by the use of live, tame, brown rats which animals will be at large and free, show how they easily make their homes and cause havoc when there is improper protection against rats. A full size model of a section of a poultry house will be used.

Convention Speakers

Note: The following information may be of some assistance in making comments about the principal speakers who will participate at our Tenth Annual Convention to be held at the William Penn Hotel, Pittsburgh, Pa. No reference as to titles, etc., are included in the rough draft of the Program and for this reason, it was felt best to list separately the names of the outstanding speakers.

1. Dr. I. Hope Alexander, Director, Department of Public Health, Pittsburgh, Pa.

2. Professor J. J. Davis, Head, Department of Entomology, Purdue University and Agricultural Experiment Station, Lafayette, Ind.

3. Mr. G. H. Dennison, General Manager, Better Business Bureau of Pittsburgh, Inc., Pittsburgh, Pa., and President of National Association of Better Business Bureau Managers.

4. Dr. W. E. Dove, in charge, Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.

5. Mr. Thomas G. English, Chief Plumbing Inspector, Bureau of Inspection, Division of Plumbing, Pittsburgh, Pa.

6. Dr. John H. Foulger, Haskell Laboratory, Wilmington, Del.

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8. Lieut. Irwin H. Gilbert, Sanitary Corps, Sixth Service Command Laboratory, Fort Sheridan, Ill.

9. Mr. E. W. Gilliland, Chief Chemist, Mine Safety Appliances Company, Pittsburgh, Pa.

10. Mr. Melvin Goldberg, Specialist, Insecticides and Fungicides, Agricultural Chemicals Unit, Inorganic Section, Chemicals Branch, War Production Board, Washington, D. C.

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Round-up

These are troubled and dangerous days for the Scandinavians, but they still enjoy a story. One of the most recent to come out of Norway is about the Nazi who was gored to death by a bull. The secret police shot ten cows in retribution.

Controlling Slugs

Various sorts of slimy, crawling creatures are known to gardeners as slugs. It makes little difference what they are to the scientist; to the gardener they are nearly all destructive, especially to his plants with succulent foliage and stems. And he is often hard put to find effective means of control. One simple remedy used in this garden with gratifying success is powdered alum. Small pieces of orange peeling are sprinkled thickly with alum and placed on the ground in late evening over infested areas. Two or three applications at weekly intervals are usually sufficient.

—*N. Y. Times.*

RODENTICIDES—
Past, Present, and Future

By JUSTUS C. WARD,
Pharmacologist, Wildlife Research Laboratory

THE term "rodenticide" has been used to designate any substance which will destroy rodents by absorption through the alimentary tract or the lungs. This means that rodenticides include both materials that are eaten and gases that are inhaled. In the category of chemical poisons with which most rodent control specialists are familiar are arsenic, barium carbonate, phosphorus, red squill, strychnine, thallium ,and zinc phosphide. In the past Governmental agencies and commercial concerns alike have selected the most effective rodenticide for the particular job at hand from the poisons listed, thinking only of the cost of the lethal agent chosen and of the possible danger its use would entail. An assignment of an order of relative importance to the poisons listed would have to be made with regard to the rodent to be controlled. Strychnine is an excellent prairie dog and ground squirrel poison for example and would rank very high as an agent to destroy such field rodents, while it would be inferior to most of the other poisons in controlling rats. Since rat control is more important to the pest control industry a tentative arrangement of poisons in order of efficiency for that purpose might be thallium sulphate, finely divided white arsenic, phosphorus, zinc phosphide, red squill, barium carbonate, and strychnine. A somewhat different order would be necesasry if we should arrange these poisons with regard to quantities used, although information available at present would make such a list only an approximation.

Taking each item in order perhaps we can learn something of value from a survey of its present situation. Thallium before the war was salvaged from smelter smoke flue dusts from several areas in the world. Most of that used in the United States came from Germany, France, Belgium, and a small domestic supply. Merely reading the names of these points of origin explains why this country is limited to the small local production for all its thallium requirements. This domestic supply is totally inadequate and until new sources are discovered and developed, thallium will be extremely hard to get. At present tests are being run on flue dusts from Canada and from South America, with some of the samples showing workable quantities. One of the most discouraging factors is the indifference shown in pushing studies of thallium because it is not considered an essential metal for war use. Every effort possible is being made to overcome this attitude on the part of the metal refining industry, but with so much war work under way, it is not surprising that progress is slow. Even though certain South American flue dusts carry as much as 3½ to 4 per cent thallium, the problems of transportation are still serious ones. It appears that substitutes for thallium must be used for most purposes until the war is over.

White arsenic is one of the oldest rat poisons and most widely used. This material has been studied in considerable detail and one outstanding point determined is that its toxicity will vary with the size of the arsenic particles. A very finely divided powder is more poisonous than a coarse one. At present arsenic is still carried in Group 2 of the list "Relative Scarcity of Certain Materials" issued by the War Production Board. This means that arsenic is "essential" to the war industries but the supplies are not so limited as the materials of Group 1." This should not be interpreted too optimistically since it shows that the sale of arsenic is subject to possible restrictions.* If this should come, every purchase for rodent control would need to be justified. The arsenic situation is decidedly better than that of thallium, but it is not without its serious handicap.

*Since the above comment was written, bulk purchases of white arsenic have been made subject to priority restrictions.

Phosphorus is also in Group 2 and the same discussion as for arsenic will be true. Zinc (high grade) which is needed for the production of zinc phosphide is in Group 1, "The available supply of these materials is inadequate for war and essential civilian uses and in many cases for war purposes alone." When considered together, zinc in Group 1 and phosphorus in Group 2, the outlook for zinc phosphide staying on the market very much longer is not bright*

*Recent improvements in manufacturing technique have made possible the use of a lower quality zinc. This will relieve the present critical situation slightly but will not change the general picture.

Red squill was used by the ancient Assyrians and has been a more or less popular raticide ever since. Unfortunately, the rat control industry has depended for its supply of this interesting poison on bulbs harvested from the native wild plants in Italy, Sicily, and northern Africa. There are no commercial quantities of red squill bulbs available elsewhere in the world at present. Obviously then, it appears that the United States will be forced to depend upon the existing stock of this material now in the country until some time after the war or until supplies can be grown in this country, a subject discussed at a later point. For all practical purposes this means that satisfactory toxic red squill is practically off the market. This is true because bioassays of all lots of red squill now in the United States have shown them to be too low in toxicity to be satisfactory raticides. This is a sweeping statement and perhaps should be modified to exempt small lots of powder which may have been purchased some years ago and are now in the hands of Governmental agencies or commercial users. In most cases these lots are sold only in small packages or in prepared baits, so their possible existence does not change the general picture, insofar as red squill powder is concerned.

The Federal Government has been interested in this particular raticide because of its relative safety for use by the general public. When the toxicity of the red squill being imported began to decrease with each succeeding shipment, the Wildlife Research Laboratory of the Fish and Wildlife Service started experiments to determine the cause. Cooperation was set up with the Bureau of Plant Industry and with the American University at Beyrouth in Lebanon. This was well under way when the threat of German invasion interrupted active assistance by the University personnel. This made further studies of red squill in its native haunts impossible so a survey of locations where the plant might grow in the United States was started. Bulbs had been grown in small number in both Florida and California, and some of these were

used in these experiments. Although this project was well established before the United States was involved in the present war, it will be impossible to draw definite conclusions about it for several years. Unfortunately, red squill bulbs require four or five years to develop to the point where the greatest toxicity is present. This means that there is very little chance that domestic squill can be on the American market in any quantity for at least another five or six years.

From the very beginning of this propagation program careful selection will be made of the more toxic bulbs. It is hoped thereby to maintain or even increase toxicity. Even with the best of progress there will be undoubtedly a serious shortage within the next two years, but with the steps being taken to make this country independent of Mediterranean supplies after two or three "lean" years, a small domestic crop should be available.

Accordingly there remains only the stock of inferior squill now in the country on which to draw. As was mentioned, this material is too poor to be used successfully. Working in the Wildlife Research Laboratory in Denver, Mr. D. Glenn Crabtree has devised a system of red squill fortification whereby this weak squill can be made into an effective raticide. In this process the rat killing power of some of the squill was extracted and then combined with a carefully calculated amount of untreated squill powder. The resulting material was dried and ground, so that the "fortified" squill resembled the original potent powder quite closely and could be used in exactly the same way in rat bait formulas. By regulating the quantities of squill extracted and of crude powder fortified the final product can be made two to ten times as toxic as the original commercial material. The process is covered by an application for a patent for public use and is described in detail in an article on "The Fortification of Red Squill **(Urginea maritima)** by Means of an Extract of Red Squill," Journal of the American Pharmaceutical Assn., Scientific Edition, Vol. XXXI, No. 5, pp. 142-144, May 1942. Two years' experience with the process and with the fortified material has demonstrated that it is a feasible method to use.

Barium carbonate is another Group 2 chemical and it is conceivable that difficulty in getting this rat poison may be experienced before long because of that classification. It will be subject to the same restrictions as those involving arsenic, phosphorous and zinc phosphide.

This leaves strychnine as the last of the listed materials most useful in rat control. This poison comes from the seeds of a tree botanically known as **Strychnos nux vomica,** a species which grows wild in French Indo-China, the Dutch East Indies, and India. These geographical names will recall either recent Japanese conquests or threats of invasion. There are accumulated stocks of nux vomica beans in Calcutta but no one can foretell how soon that port or the sea lanes serving it will be under the domination of the enemy. Every effort has been made to obtain a shipping priority for nux vomica and the Maritime Commission has granted such a preference rating. Since the last open port may soon be blockaded or ships carrying nux vomica sunk enroute, it is obvious that there is no certainty regarding future shipments of strychnine.

The amount of this alkaloid known to be available for sale in this country at present is quite limited. Even with the most stringent economy of use domestic stocks may be exhausted

(Continued on page 31)

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Attractants and Repellents for INSECTS

By DR. E. G. THOMSSEN *and* DR. M. H. DONER,
The J. R. Watkins Co.

THE word "insecticide" literally means "insect killer" but by popular connotation refers to any substance employed for the purpose of affording at least temporary relief from the attack of insect pests on plants or animals. In actual practice these conditions are accomplished either by reducing the number of pests so as to curtail injury, and at the same time checking their increase in numbers and distribution, or by preventing injury through the use of repellents. Obviously, the ideal form of control, whether by cultural, biological or chemical means, is through the outright destruction of insect life for in no other way can insect pest population be reduced to a minimum. On this basis, then, insecticides are being developed with ever higher killing power. The development of the newer fly spray toxics of high killing power is a case in point.

The agriculturalist, on the other hand, is interested not alone in the killing power of the materials he employs for controlling insects but also to protect his crops from injury until harvest time. If he can protect his stock or crops by applying materials that repel insects, or better still kill them, his insect control problem is solved. In another direction, the control of Japanese beetles on ornamentals is not so much a problem of destroying the insects on their host plants as it is of protecting the latter by insecticides that tend to repel the beetles from the foliage for an extended period of time. We must not overlook that chemicals may serve to lure insects to traps or to render palatable toxic compounds that would otherwise be rejected, as is illustrated by the use of traps containing aromatics and by the popular use of poison baits.

Chemical control of insects, because it involves toxicity, repellency and attractancy, necessitates a knowledge of the chemical senses of insects.

Insect survival, as is true for all living creatures, depends upon satisfactory adjustments to changing conditions of environment. Organisms that do not make these adaptations successfully lose out in the struggle for existence and become extinct. Insects have been very successful in adjusting themselves to their environment —a price factor in explaining the increasing damage which they are able to do year after year.

The manner by which organisms make these adjustments is a fruitful field of research for the biologist. There appears to be much in favor of the Loeb theory that insects react to their respective environments much as do iron filings in an electro-magnetic field. Insects respond one way or another, as the case may be, by certain inherent qualities of their constitution. Actually the environment is more complicated than an electromagnetic field, because while the latter involves only magnetic forces, the environment involves an array of different forces or stimuli, the more important of these being light, temperature, moisture, gravity, contact movements of the medium and chemical factors. The reactions of insects of these various stimuli vary. For instance, some insects are positively heliotactic, that is, they move **toward** the source of light, while other insects are negatively heliotactic, they move **away** from the the source of light. Characteristic positive and negative responses hold true for the other types of stimuli mentioned above as well. What causes a definite response for one species of insects may cause a totally unlike response in another species. In other words, only by experiment can one determine how a given insect will react to a certain stimulus or set of stimuli. Not only do insects vary in their response to a given stimulus but, as pointed out by Richardson, "a given set of stimuli is not effective for all species." The manner in which different species of insects respond to chemicals is of extreme importance to the economic entomologist.

Among the chemicals making for insect responses, the volatile chemicals, i.e., those concerned with olfaction, are of considerable importance in the lives of insects. The odor stimulus may either act alone or in combination with such other stimuli as taste, moisture and texture. As we will discuss later on, a number of technical devices have been developed for the purpose of testing accurately the olfactory responses of insects. The results of studies conducted with different insects in these various "olfactometers," together with observations of insect responses in the natural environment, leads one to the conclusion that the insects have an olfactory sense as acute, if not more so, than that existing among any other group of animals. Because the olfactory sense can be studied with greater accuracy than the sense of taste, considerably more data has been accumulated on the smell sense of insects. The interpretation of data on the chemo-responses of insects has been attended by the common difficulty of differentiating between the closely related senses of gustation and olfaction. Workers proceed on the basis that chemicals affecting responses of an insect from a distance involve olfaction, whereas responses of insects brought about by direct contact of the sense organs with chemical substances properly referred to as taste.

Among the higher forms of animal life, there is a structural differentiation of the chemo-receptors as well as a difference in their location. This is not entirely true for the insects. Separating the organs of taste from those of smell on a structural basis has been practically impossible. All that can be said is that these sense organs, i.e., the sensillae, that are concerned chiefly with smell, are located on the antennae, whereas the taste sensillae are usually associated with the mouthparts or trophi. There are exceptions to this, as already indicated, for it is known that certain butterflies and flies taste largely through their feet, whereas cockroaches have olfactory sense organs on certain posterior appendages (cerci). The sensillae commonly consist of peg-like innervated hairs distributed over the surface of the body. They may stand upright on the surface of the body wall or may be sunk into deep pits. Or, the cuticula or body wall overlying the sensory cells may be extremely thin and permeable. The number of chemoreceptors that occur on the antennae of insects is variable and surprisingly large in number. Thus McIndoo found from 13,000 to 14,000 such structures on each antennae of a wasp **(Vespa crabro).** Other investigators report 35,000 to 39,000 on each an-

tennae of a June beetle **(Melolontha sp.)**.

The true chemico-physical explanation of olfaction is still unsettled but workers are agreed that smell is possible, among the higher animals at least, only when the odoriferous particles fall on **moist** olfactory membrances. Whether this is true among the insects is a question, for while the eminent Italian entomologist Berlese maintained that the insect olfactory sensillae are kept moist by the secretion of one or more associated glandular cells. Snodgrass maintains that "all the sense organs, except those of the preoral cavity and the alimentary canal, are situated on dry, external surfaces." Whatever the situation is, the fact remains that insects are highly sensitive to odors.

Functions of Chemical Senses

At least three functions can be attributed to the chemical senses of insects:

(1) Food Selection for Oviposition

In general, insects exhibit a profound specificity in their selection of food.[2] The successful raising of caterpillars of butterflies and moths, for example, depends upon selecting the type of food peculiar to the larva's taste. Other foods are promptly rejected. Cabbage worms feed almost entirely on crucifers, the leaves of which contain mustard oil. If leaves of other plants rejected by the larvae are smeared with mustard oil, they are promptly accepted. This early (1916) observation has been confirmed by other workers for different insects. Thus it appears that many female moths and butterflies select the proper hosts on which to deposit their eggs by responses to a definite odor stimuli. Whether the females are guided by memory of the food eaten as a larvae, by a fixed inherent impulse, or by responding in a precise way to one or more sense reactions, is a question still in dispute.

Richardson has reviewed the literature on the oviposition response of insects and notes numerous cases where odors attract females to a particular medium in which to oviposit. Thus blow flies (adults of the screw worms) lay eggs only on decaying meat, houseflies are attracted to the odor of ammonia proceeding from horse manure and vinegar flies (Drosophila) to overripe fruit by the odor of vinegar and certain acids. The selection of hosts by parasitic insects is controlled by an odor stimulus. In all of these cases, while odors attract female insects to particular hosts, the inducement to actually deposit eggs is regulated by other factors, as Richardson points out, such as "the intensity and wave length of light, temperature and humidity, rate of movement of the medium in which she lives, odor, and the physical and chemical character of the surfaces . ."

According to Crombie[6], the lesser grain borer **(Rhizopertha dominica)** locates food by the smell sense, although the choice of a suitable oviposition medium is controlled by tactile sensations.

(2) Sexual Attraction

It is well known that insects communicate with one another largely by smell. This is the chief "language" of the honeybees, ants and termites. Recognition of worker bees at the hive entrance is accomplished by the odor of the worker. Ants leave scented trails which guide them back to the colony. Equally important is the role of odors in drawing together the sexes during the mating period. The males of many moths, for instance, bear specialized tufts of hairs on the legs and wing bases which emit an odor for the sole purpose of attracting members of the opposite sex. Freshly emerged females are known to attract males from considerable distances. Collins and Potts[5] report a distance of 2.38 miles for male gypsy moths flying against a breeze. These investi-

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gators also found that extracts prepared from the reproductive tissues of unmated females likewise were attractive to males.

(3) Food Selection

Many insects locate their food by smell and it may be inferred that the scent of flowers exists for the sole purpose of luring insects to their blossoms to effect pollination. More than 140 years ago, Charles K. Sprengel distinguished two types of flowers: those with small, scarcely visible flowers, lacking scent, and which are dependent upon wind for pollination; and those with conspicuous, highly-scented flowers dependent upon insects for pollination. From a very interesting paper on the language of bees by Von Frisch, we quote:

"If a new kind of flower begins to bloom in a certain region, it is discovered, after some time, by scout bees. The first bees find the flowers full of nectar. They find plenty of food and after homing they report the discovery by dancing, and in addition indicate the species of flowers by means of the scent adhering to their bodies. The bees communicated with, fly out looking for the flowers with this specific scent. Flying out in all directions, they find out in the shortest time the plant which has commenced to bloom, wherever it is in the entire flying district. Where there are already collecting bees, the scent of the scent organ makes it easier for fresh questing bees to find a good feeding place. When the number of bees has become sufficient to collect the amount of nectar in these flowers, the flowers are no longer full of nectar, the nectar becomes scarce, there is no more dancing, and the number of bees does not increase. If different plants begin to bloom at the same time, the flowers with the sweetest nectar cause the most vigorous dancing and, incited by the scent adhering to the body of the dancer bee, the largest number of bees fly to the best feeding plants."

Recent studies by Dethier[8] on the larvae of swallowtailed butterflies (Papilio) indicate that the selection of food is controlled by repellent (physical condition of the plant — toughness, pubescence of foliage, etc.) or attractant (essential oils). Thus, certain species are attracted to parsley due to certain essential oils, methyl chavical, anethole, carvone, coriandrol, sedanolid).

The fact that many of our noxious forms of insects are responsive to volatile chemicals has led to a study of odoriferous substances for mitigating their attack. Two classes of compounds are thus employed, attractants (attrahents) to lure insects to poisoned baits and traps, etc. and repellents for repelling insects. The common use of molasses, salt, and other materials for rendering baits more attractive to insects (cut-worms, grasshoppers) is more likely concerned with the insect's sense of taste than of smell.

Attractants

It is a matter of common observation that insects are attracted to many odoriferous substances. An overripe banana or an open jar of vinegar is a sure lure for **Drosophila,** the vinegar fly. A dead rodent quickly attracts a variety of carrion beetles. The exuding sap of maple trees in early Spring attracts multitudes of beetles and butterflies. One of the favorite methods of collectors of moths and butterflies is the smearing of trees, fence posts and other objects with a fermented mixture of brown sugar and molasses. On visiting the "sugared" trees and posts with a suitable light many hundreds of moths will be found imbibing the sweets, among them many of economic importance.

The possibility, then, of utilizing substances for attracting insect pests is one that has met with considerable success in several instances. Adult Japanese beetles can be collected in huge numbers by the use of traps containing a mixture of geraniol and eugenol. According to Jones and Haller about 25,000 pounds of geraniol have been used annually for this purpose.

The suspension into trees of pans filled with sweetened mixtures to lure pests has been used extensively by commercial orchardists in their fight against the codling moth. In 1927, the Washington Experiment Station recommended a mixture of one gallon apple cider, one-half pound brown sugar, one cake of yeast, to which was added, after fermentation, four gallons of water. In one test 17,429 moths were caught on 93 traps in a six acre orchard. The moths are killed when they entrap themselves in the liquid bait. Studies at the Ohio State Station have indicated that the use of bait pails is "not a practical method of control" for this insect.

The most popular use of baits in orchard insect pest control has been as an aid in establishing spray schedules by daily observation of moth populations at traps. Here again the codling moth serves as an illustration. The successful control of this insect depends upon applying sprays at a precise time during the moth flight so that the fruit will be protected by a coating of poison to prevent the hatching larvae from gaining entry. Although there is an established apple spray schedule that orchardists follow, there still is no way of knowing the exact time the spray should be applied except by the use of bait traps. Owing to the variations which can exist in any one limited area, many orchardists operate their own bait traps or "hootch traps" as they are called. The entomologists at the experiment stations similarly operate traps and inform growers by radio or post card when to spray for most effective results.

In an effort to make codling moth baits more attractive to the moths, various materials have been tested, some of which appear promising. Early work at the New Mexico Station[9] proved that a 1-10 dilution of a certain kind of corn syrup and water was more effective than ethyl oxyhydrate (from vinegar) which, in turn, was more effective than the same ester produced from cane sugar. Later a series of aromatic chemicals was studied and tests showed that the "methyl series of phenyl, acetic, malonic, propionic, and oxalic acid esters, and the ethyt series of malonic, propionic, and oxalic acid esters were significantly attractive." In subsequent studies it was reported that the phenyl derivatives of the lower organic acids, alcohols and esters were more attractive than their parent compounds. A great deal of data is involved in these studies which will suffice to illustrate the attention that has been given to chemicals for attracting adult codling moths to baits.

The Oriental Peach Moth **(Laspyresia molesta)** is similarly attracted to baits of fermenting molasses yeast mixtures.

Investigations of the U.S.D.A. Division of Truck Crop and Garden Insects, have shown that certain amyl esters of salicyclic acid attract tobacco horn worm moths.

The use of odors along with traps to attract and kill insects is a promising field for investigation and already has shown considerable promise for the Japanese beetle. Of numerous materials studied by Metzger of the U. S. Department of Agriculture, a liquid consisting of one part eugenol and ten parts of geraniol, with or without one-half part of phenyl ethyl alcohol, was the most effective.

Studies by Wilson at the Wisconsin Station revealed that clothes moths and carpet beetles are attracted to baits of fish meal spread on sticky fly paper. By placing such baits in closets for varying lengths of time, considerable numbers of these insects were captured.

Naphthalene, paradichlorobenzene, and oil of cedar have long been used to protect fabrics from infestation by clothes moths and carpet beetles. Although there has been some controvery over the true repellent value of these materials (certain investigators claiming no repellency) it appears, as pointed out by Herrick that they actually do repel as well as kill fabric insects.

Houseflies are readily attracted to the odor of formaldehyde and solutions of it in sweetened milk have long been recommended as an effective means of control.

A new development in the control of fruit flies is the use of protein lures. McPhail observed that the Central American fruit fly **(Anastrepha striata)** were attracted to proteins in the presence of sodium hydroxide solution. Casein, gelatin, filter-press mud, baker's yeast, cow hide with hair attached, cow blood, egg white and wheat shorts and certain amino acids were attractive. Additional work by Dean[7] on the apple fruit fly **(Rhagoletis pomonella)** with protein lures gave further indications of the possible usefulness of such materials in insect control.

The study of chemicals for attracting insects is a matter of growing interest to the economic entomologist since it has a bearing on the control of a considerable number of important insect pests. Much more work, however, needs be done before this phase of chemical control of insects can be said to be adequately utilized.

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—Reprinted from Soap and Sanitary Chemicals, April, 1942.

Rat Blocks Door to Women

Cleveland, Aug. 17.—A rat blocked the door of an apartment-house basement today and refused to retreat after five women had finished their Monday wash. Mrs. John Gold climbed through a window and telephoned police while the other four jumped on tables and chairs. Two radio patrolmen killed the rat.

—N. Y. Times.

The Rat Campaign

We're going to have a rat campaign,
In the state again next fall;
In order to put it over,
We will need the help of all.

Yes, we're going to kill the rats,
Or else put them all to flight;
So mark it on your calendar,
To start on Halloween night.

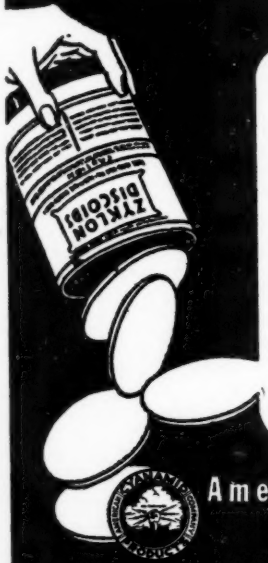
We don't want slinking garbage lice
To infest our house and barn;
The many germs they spread around,
Should fill us with alarm.

And then their enormous appetites,
From the food they eat, and sip;
Creates enough waste on the farms
To build a battleship.

So make a note of the date right now,
Help eliminate this curse;
We've set the date for this campaign,
On October thirty-first.

Don B. Whelan, Extension Entomologist, University of Nebraska, Lincoln, Nebr., who authored the foregoing rhythmic announcement, further indicates that main emphasis, in the Nebraska rat program, will be to educate the public on the general need for effective control measures, with the added suggestion that it either do its own control work using commercially prepared baits for that purpose, or that it call in the PCO. An extensive advance publicity campaign urging cooperation on the part of governmental and other interested agencies in preparing the public for the program, is now under the aegis of Mr. Whelan.—Editor.

BETTER KILLS BETTER JOBS BIGGER PROFITS



For Fumigating Use ZYKLON DISCOIDS

No more guesswork. Do better jobs with this handy packaged fumigant. ZYKLON DISCOIDS are ready for instant use. Open the can and scatter the discs into rooms to be fumigated. No corrosive liquids and no dangerous residue. DISCOIDS give off a powerful gas that penetrates into every crack and crevice—kills insects wherever they may be. Send for "Zyklon Discoids Fumigation Manual"—FREE.

For Rat Control Use CYANOGAS

This is a powder giving off a gas —NOT A BAIT. Kills rats and mice *instantly*. Successful where baits and other means fail. Simply pump the powder into the rat holes. The gas liberated penetrates to all parts of the runs. With a Cyanogas-Foot-Pump-Duster and CYANOGAS A-DUST you can make big profits. Special ruggedly built duster $5.75. Write for free booklet on rodent control.

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Public Health Aspects of Household Insecticides and Disinfectants

By H. C. FULLER*

LINNEAUS, Swedish naturalist and originator of our present systems of zoological and botanical classifications, remarked 150 years years ago, that three flies will consume the carcass of a horse as quickly as a lion can. A hundred years later in Ceylon, Sir Samuel Baker, mighty hunter and explorer, observed that three weeks after an elephant is killed, and allowed to remain unmolested, nothing is left but his bones and a heap of dried cases from which flies have emerged.

Howard, our most prolific writer on entomology, estimated in 1931 that the total number of different species of insects was not less than four million. Man in one form or another has left records for at least four hundred thousand years, insects are found in the fossilized state in the geological deposits of three hundred million years back, hence they have had a much greater opportunity to evolve a persistent type.

Insects not only have persisted throughout the climatic changes, shifts and upheavals of the globe, but they have grown smaller and more adaptable to the seas and continental areas that finally came to rest in their present forms. Back in the carboniferous age some insects, such as the giant dragon fly had a wing spread of two feet. Cockroaches have been constant inhabitants of the earth since the same period, and both types were for all intents and purposes of the same shape and general characteristics as the forms we see today sailing over the mill ponds and scuttling across the kitchen. The older paleontologists were wont to call the Pennsylvanian period, 200 million years ago, the age of cockroaches. Eight hundred fossil species have been described. Mosquitoes and ants found in amber, a fossil resin of the lower Oligocene, are no different in appearance from those now prevalent.

In order that you may have some conception of the vast extent of time that we have just noted, we might take a year of 365 days, as our yardstick. Let us assume that 3,650,000,000 years have elapsed since the earth, with the other members of our solar system, broke off from the sun, their parent. The geologists and chemists make it slightly less but, for the purpose of illustration, the figure will suffice. So let us make a year ago today the date of origin, and then each day since would be the equivalent of 10,000,000 years. On that basis our insect friends were flourishing and well established over a month ago, while our species did not show up until last week, about six days back to be more definite. Many did not start making bronze implements until less than a minute ago, and modern civilization as we know it, is but a few ticks of a stop watch.

Now just a few words in the same vein about bacteria and fungi. They go back to real antiquity and were present among the blue-green algae and other forms of vegetative life that appeared along the shores and in the sea a billion years ago, perhaps four or five months, on our time chart. It was fully two billion years after the solar indigestion before life appeared on the globe.

Bacteria left no fossil remains, but we find evidence of their work in the Pennsylvanian coal beds where plant tissue from the deposits shows destruction of cell walls that is ascribed to bacterial action. Moreover the deposition of pre-Cambrian iron ores, a billion years back, is attributed in part to the same cause. They occurred in the Paleozoic petroleum deposits, and feeding on the organic matter in the rocks, transformed it in part to petroleum and gas. Hence bacteria and fungi were really established before insects. They have persisted without interruption.

The antiquity of insects combined with their ability to persist, and their remarkable powers of reproduction as exemplified in the beginning paragraph, are worth considering for a moment. Those facts, and the increasing extent to which man has become conscious of the personal annoyance of health hazard of insects, coupled with the activities of governmental agencies in developing ways and means for their control, lends considerable emphasis to the statement uttered on more than one occasion that we are living in an age of insects rather than an age of man.

There is more than a modicum of truth in that assertion. After man settled down to a more or less socialized state of living in Neolithic times, and community life developed until the so-called civilized state emerged, he began to upset the balance of nature and he has been doing it ever since. Populations became exposed to insect ravages in a mass manner. What happened in one instance was that the mosquitoes of the Roman marshes got in their work, and the health and stamina of the people declined on account of malaria spread by those pests. That, combined with the softness engendered by the vicious life of the times, made it easy for the virile tribes of the north to hasten the disintegration of the Empire. Other natural calamities can be traced indirectly and directly to the influence of insects working in environments favorable for mass attack. Witness the terrible ravages of the plague in the middle ages when crowded living conditions and filthy habits favored the increase of rats and consequently the rat flea which spreads the disease. In modern times the development of large scale agricultural operations have provided unique and favorable environments for pests to propagate and multiply in numbers beyond the means of their natural enemies to control.

Insects as has been previously noted, have been part of the natural picture for at least three hundred million years. The type has been tried out thoroughly under world conditions while the human species is comparatively in its merest infancy. The balance of nature kept them within reasonable bounds as far as we can determine. They war among themselves, their life cycles are usually of short duration, and they have natural enemies among the zoological forms, particularly the fishes and birds. If by some unfortunate circumstance our bird life were suddenly annihilated, the aspect of the earth's surface, as we know it today, would disappear in spite of all the artificial control measures that man is capable of providing. The importance of birds in keeping the insect population under control is recognized in the Migratory Bird law

*Technical consultant, N.A.I.D.M. Address before the 28th mid-year meeting, Natl. Assn. of Insecticide & Disinfectant Mfrs., Chicago, June, 1942.

and the treaties for its enforcement entered into by this country with Canada and Mexico.

Howard puts it tersely when he says that the human type may be one of nature's experiments that will fail. It has not been in existence long enough to have been thoroughly tried out. It has jumped to the fore owing principally to the evolution of the quality known as intelligence. Through this intelligence it has either destroyed or controlled or converted to its own use nearly all other forms of life.

However in its rapid increase and spread, the human species has so disturbed the balance of nature as to favor the spread of disease-bearing micro-organisms and to encourage enormously the multiplication and spread of injurious insects. In its efforts to feed its increasing millions, the human race has fed increasing millions of insects.

When the public began to wake up to the fact that insects were actually a menace to health, life and pocketbook, and not simply annoyances that were endured because they were part of everyday existence, means were sought to curb their spread and depredations. Later when it was definitely established that they contributed to the spread of debilitating and fatal maladies, the picture took on a more serious aspect and the war became not only defensive but offensive. Then our scientists settled down to a study of life histories, and intelligent measures were developed for the destruction and control of injurious species. The natural sequence to this was the enactment of laws to control the traffic in insecticides insofar as concerns their purity, effectiveness and health hazard.

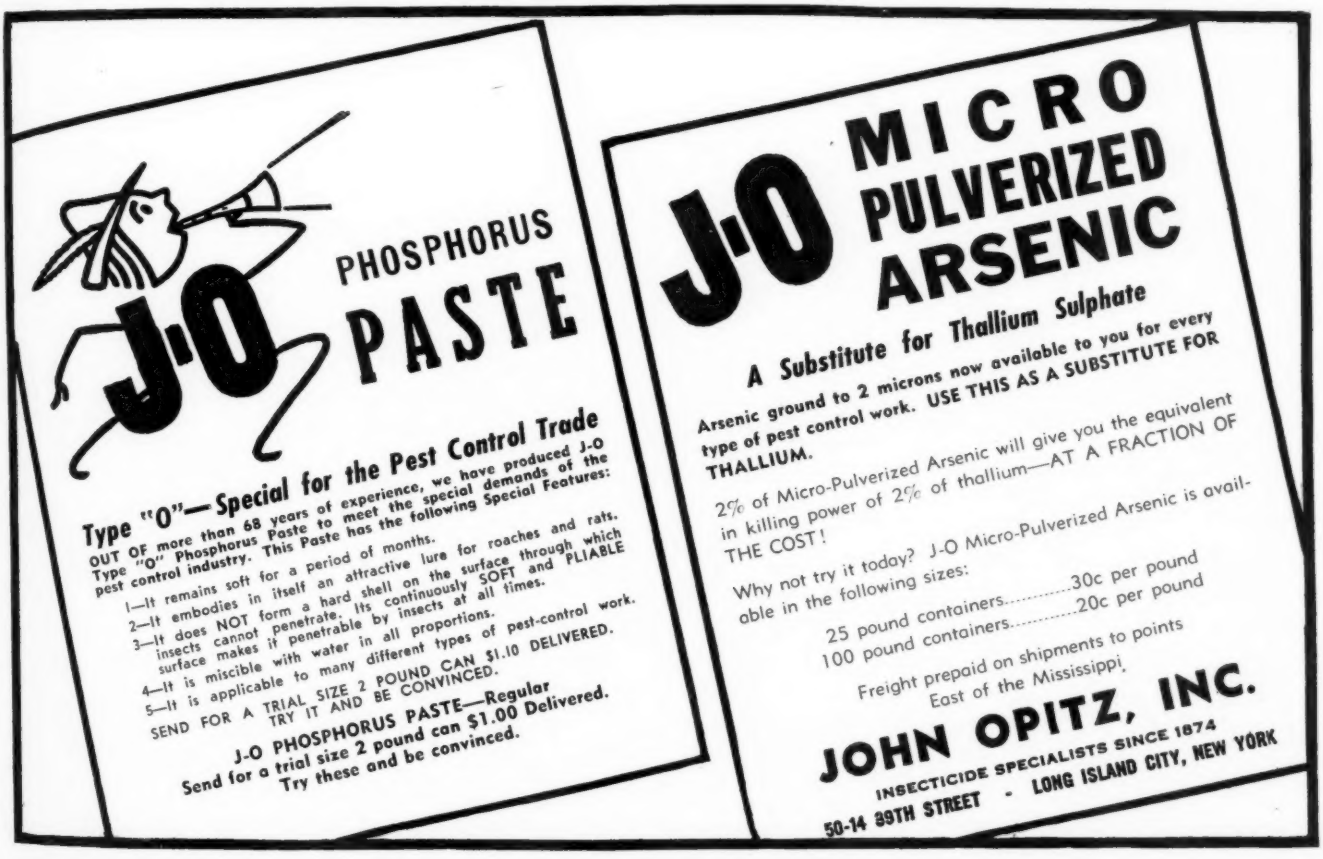
The relationship between mosquitoes and the spread of yellow fever and malaria; fleas and plague; lice and typhus; flies and typhoid, are too generally known and accepted to require discussion. Mosquitoes, fleas and lice are necessary intermediaries for the distribution of the diseases; flies transfer disease organisms by contact. It is a peculiar provision of nature that the insect hosts are not affected fatally by the same diseases which may be fatal to man.

Mosquitoes are now credited with the spread of equine encephalomyelitis, a form of sleeping sickness that may be transferred to humans. Ticks of course are necessary to infect humans with Rocky Mountain spotted fever, and this disease has stealthily moved from its original range until it is now established throughout the country, and there are annual outbreaks during the tick season on the Atlantic seaboard as far north as Massachusetts.

Besides typhoid, Rosenau reports that flies may transmit the infection of erysipelas, anthrax, glanders, cholera and dysentery. It is known that flies may ingest tuberculous sputum and excrete tubercle bacilli, which may remain virulent as long as 15 days. It has been found that a single fly may carry from 500 to four and a half million bacteria upon its surface and from sixteen thousand to twenty-eight million in its intestinal tract.

Certain species of bacteria, ingested during the larval period of the house fly in filth, garbage or excrement, retain their viability while the host is undergoing the process of metamorphosis, and continue their existence in the alimentary canal of the adult.

Flies may transmit disease organisms mechanically. They may be carried upon the proboscis or on the surface of their bodies, but it is considered that the usual mode of transfer is through their dejecta. Thus disease may be carried to the lips, nostrils, fingers and surface wounds, and also distributed on food and other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objects. The importance of sanitation in the household is thus apparent.

Flies are credited with the ability to carry the virus of infantile paralysis. The theory is not new. It is current at the present time, and while it has not been proven to the universal satisfaction of the medical fraternity, it is at least a good bet and should not be ignored.

Roaches are a sanitary menace. They have become domesticated to the extent that they inhabit sewers, toilets, water mains as well as kitchens and storerooms. They are capable of transmitting infection mechanically. Moreover their excrement and a fluid from their mouths fouls the food with which they come in contact, as well as cupboards, table drawers, and wherever they abide.

The bed bug, further to quote Rosenau, is a truly domesticated insect. It has accommodated itself completely to the environment of human habitation. It is a sanitary menace and is under suspicion as an intermediary in the transfer of many infectious diseases such as relapsing fever and leprosy. On the other hand there is no convincing evidence that it is the usual or ordinary transmitter of these or any other disease known to us. When it acts as an intermediary host it apparently does so by mechanical transmissions of the disease organism on the mouth parts. But in the case of the beg bug, as with the fly as a possible carrier of infantile paralysis, it is another sanitary menace that should be rigorously controlled.

At the present moment we are in the midst of an emergency. There is an Office of Civilian Defense which has, for one of its objects, the safeguarding of our population from a state of nerves—to prevent us from reacting to situations which ordinarily would not cause concern. But our people are now more than usually on the alert about their kitchens and particularly the food on the shelves and in the ice boxes of the homes. Bugs, whatever they may be, ants, roaches, bed bugs, fleas and flies with their well known propensity to soil and contaminate, contribute to hysteria, and their control in the home needs attention from this standpoint as well as the economic.

The same may be said for transportion facilities, rail, bus, ships, airplanes, and the eating places along the line. They are all unusually congested, and with the curtailment of private means of transportation, their capacity will be taxed more and more as time goes on. Insect control and sanitary cleanliness by our public carriers is a matter of concern to them right now.

Let us now turn to the military phases of our national life and see how they may affect the civilian population from a public health standpoint. We are engaged in warfare with people in widely separated areas, and among populations that are inured to diseases with which our men have had little or no contact. American boys will furnish virgin feeding ground for organisms, viruses and parasites new to them. When they are captured and placed in concentration camps it is a foregone conclusion that many of them will contract new maladies. Some of them will recover from the troubles and come home in good shape, others will carry the spreading agents in latent form, and be the means of passing along through insect vectors, new maladies which they contracted afield or types of disease that are established here but which will be disseminated in new forms.

As an illustration of the latter, I will cite what happened when a detachment of Nebraska troops went to the Philippines during the pacification period. The soldiers contracted what we will call a form of "Malaria" not then known in our country. On returning to their native soil, some of those men carried the parasites in the blood, and in a short time, due to transference by mosquitoes, the same disease became prevalent among the civilian population, to the consternation of the local physicians who were unfamiliar with the particular type of malady that confronted them. In the same manner we shall harbor prisoners of alien races and foreign groups who will carry the germs of diseases new to us, some of which may be transmissible by common insects.

This story is not a scare headline. It is a situation that deserves sober thought, and should be recognized and given due consideration by those in authority whose activities in any way are concerned with the public health, the care of our sick and the control of agents that are essential for the mitigation and destruction of pests or the minute organisms they collect and harbor. I believe there is a realization of the situation, even though some of you may feel that it has not been given the recognition that is its due. Those of you who are engaged in the production and distribution of agents designed to control the spread of insects in the home and on the farm, as well as for use by our military forces, ought to be given every encouragement possible to pursue your work unhampered. And the same freedom should be accorded those whose energies involve the formulation of various types of disinfectants and fungicides necessary to kill the actual disease agents, the micro-organisms, bacteria, fungi and parasites, which, when implanted in or on the bodies of man or animals, produce the effects that characterize disease.

I have brought to your attention a few of the high points in an endeavor to explain the relation of insects and micro-organisms to the public health, and why under the existing emergency, there should be no cessation in their control and destruction. I will summarize the situation by emphasizing:

1. Insects, fungi and bacteria, in their present forms were established millions of years before the human species appeared upon the earth.

2. Insects, fungi and bacteria have demonstrated their ability to persist, through all the geological and climatic upheavals that have occurred since their appearance in the natural picture, while the human species is yet in its experimental stage.

3. The spread of disease by certain species of insects is common knowledge.

4. Both insects and micro-organisms multiply with exceeding rapidity.

5. Constant vigilance coupled with rigorous control is necessary to curb the depredation of insects, parasites and micro-organisms.

6. Under the present emergency no factor should be ignored that will aid in maintaining the poise of the civilian population and preserving the public health.

7. Adequate provision should be made to control insect and bacterial life that is liable to affect our armed forces at home and abroad, and those of the belligerent nations that may be harbored in our territory.

8. With this end in view our responsible officials in high places in the government should realize there is a public health problem confronting our population and have a sympathetic understanding of the situation, and see that there may be a comprehensive cooperation with those who are endeavoring to provide adequate supplies of insecticides and disinfectants for the welfare of our forces and the population as a whole.

—Reprinted from Soap and Sanitary Chemicals, August, 1942.

Funny Thing, But

Most insects are extremely fussy as to where they lay their eggs, so their offspring, on coming to life, may have ample to eat. But very few insects ever see their own progency—and probably couldn't identify them if they did see them.

—So says Neil O'Hara in the N. Y. Post.

Additional Patents Relating to Pest Control

By DR. R. C. ROARK

EDITOR'S NOTE: *This service is provided through the Department of Agriculture for the purpose of bringing to the attention of those interested such matters that may be of assistance to the industry. The Department of Agriculture assumes no responsibility for the merits or workableness of any of the inventions mentioned. Copies of all patents can be obtained for 10c (no postage stamps) sent to the Patent Office, Washington, D. C. When placing orders be sure to note the number of the patent, the date, the name of the patentee and the subject of the invention.*

2,285,184 (June 2, 1942; appl. Jan. 10, 1941). PEST CONTROL. Euclid W. Bousquet, Wilmington, and Hubert G. Guy, Newark, Del.—E. I. du Pont de Nemours & Company, Wilmington, Del. An insect control composition contains as an essential active ingredient N-allyl-N'-cyclohexyl thiourea.

2,285,409 (June 9, 1942; appl. Feb. 26, 1941). PEST CONTROL. Euclid W. Bousquet and Ellsworth K. Ellingboe, Wilmington, and Hubert G. Guy, Newark, Del.—E. I. du Pont de Nemours & Company, Wilmington, Del. A pest control composition contains as an essential active ingredient a 1,2,4-dithiazole.

2,285,410 (June 9, 1942; appl. Feb. 27, 1941). PEST CONTROL. Euclid W. Bousquet, Wilmington, and Hubert G. Guy, Newark, Del.—E. I. du Pont de Nemours & Company, Wilmington, Del. A pest control composition contains as an essential ingredient a 1,2,4-thiadiazole.

2,285,563 (June 9, 1942; appl. June 23, 1939). SUBSTITUTED DIHYDROXY-DIPHENYLS. Edgar C. Britton and John E. Livak, Midland, Mich.—The Dow Chemical Company, Midland, Mich. The patentees claim 3.3'-di-cyclohexyl-4.4'-dihydroxy-diphenyl, a white crystalline solid having a melting point of approximately 209°-213° C. The substituted dihydroxy-dipenyls are useful as toxicants, etc.

2,285,950 (June 9, 1942; appl. Jan. 10, 1940). METHOD OF APPLYING INSECTICIDES. William N. Sullivan, Washington, D. C., and Lyde D. Goodhue, Berwyn, Md.; dedicated to the free use of the People in the Territory of the United States. A method of dispersing rotenone, rotenone bearing resins, compounds related to rotenone and the resin from which the rotenone has been removed consists in depositing a solution of any of these insecticides onto a surface heated at a temperature between 300° C.-500° C., thereby releasing the insecticides in the form of a smoke.

2,286,169 (June 9, 1942; appl. May 31, 1940). AROMATIC SUBSTITUTED METHYL ESTERS OF HYDRAZOIC ACID AS INSECTICIDES. Ingenuin Hechenbleikner, Stamford, Conn.—American Cyanamid Company, New York, N. Y. An insecticidal composition includes a toxic amount of diphenyl azido methane, triphenyl azido methane, or 1-naphthyl azido methane.

2,286,222 (June 16, 1942; appl. Mar. 11, 1940). INSECTICIDAL COMPOSITION. Clarence L. Moyle and Fred W. Fletcher, Midland, Mich.—The Dow Chemical Company, Midland, Mich. An insecticidal composition comprises an organic thiocyanate and beta-(2.4.6-trichlorophenoxy)-beta'-chloro-diethyl ether.

2,286,330 (June 16, 1942; appl. May 28, 1940). GUANIDINE FERRICYANIDE COMPLEX. Robert B. Barnes, Stamford, Conn.—American Cyanamid Company, New York, N. Y. A method of preparing a guanidine ferricyanide comprises reacting a saturated solution of an alkali metal ferricyanide with a saturated solution of guanidine carbonate at room temperature and collecting the precipitated crystals of diguanidine alkali metal ferricyanide. These are also useful as moth larvae repellents.

2,286,568 (June 16, 1942; appl. Apr. 3, 1941). INSECT DESTROYER. Albert C. Petry, Anderson, Ind.

2,286,636 (June 16, 1942; appl. Oct. 1, 1941). INSECTICIDE. Charles W. Murray, Glenside, Pa.—Claude R. Wickard, as Secretary of Agriculture of the United States of America, and his successors in office.

(Continued on Page 26)

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Evaluating Protection of Fabrics from Clothes Moth and Carpet Beetle Attack[1]

By RALPH E. HEAL, *Rutgers University, New Brunswick, N. J.*

AN INVESTIGATION[2] has been made of the efficiency of various materials as agents for the protection of fabrics against the attack of the larvae of clothes moths and carpet beetles. In the course of this investigation a method for the biological evaluation of this protection has been evolved. This method is not completely original, as the practices of other investigators have been adopted freely. It is considered, however, that this method, in its entirety, presents certain advantages of accuracy and uniformity over other published methods, and, as such, may be of value to investigators desiring to standardize tests of this nature.

The accuracy and uniformity of the test is based upon its operation under carefully controlled conditions of temperature and humidity, and upon the utilization of test specimens of constant age and developmental background.

All rearing and testing is done in a laboratory in which the temperature is maintained constantly at 74° + or — 1°F. and in which the relative humidity is held at 60 per cent + or — 2 per cent. These conditions are not optimum for the most rapid development of the insect stock, but they represent the nearest approach to optimum conditions under which man can work comfortably. As the uniformity of the test insect stock is considered of prime importance, the methods of rearing and maintaining laboratory cultures of the test species are described in detail.

The test is designed so that a single standard procedure can be utilized in evaluations made with the larvae of any species of clothes moth or carpet beetle. The details of the rearing of and the testing with the following species are described: the webbing clothes moth, **Tineola biselliella** (Hum.), the black carpet beetle, **Attagenus piceus** (Oliv.), and the furniture carpet beetle, **Anthrenus vorax** Waterhouse.

MAINTENANCE OF WEBBING CLOTHES MOTH CULTURES.

—The method of rearing the stock of webbing clothes moth larvae is adapted from that developed by and supplied to the writer by A. H. Goddin of E. I. du Pont de Nemours & Company. Certain modifications have been made in this method to facilitate its use.

The cultures of webbing clothes moth larvae are established from eggs so that the age of each individual is known within a range of 2 to 3 days. To maintain a continuous supply of larvae under these conditions it is necessary to establish new cultures thrice weekly. The cultures are reared on a medium consisting of rolls of woolen cloth which have been supplemented with dry powdered brewers yeast. These rolls are kept in two-quart wide-mouth jars with open-centered screw-type closure rims.[3] The jars are closed by a circle of filter paper held in place by the screw-type rim. In practice two jars of stock are established thrice weekly. One jar is reserved for reproductive service and the other is used as a source of larvae for test purposes.

Egg collection is made from a special oviposition cage. This cage is prepared from a two-gallon friction-top tin can. Two rectangular areas, each 6 in. long and 4 in. wide, are cut from the side of the can opposite to each other. The long side of each rectangle is a half-inch from the bottom edge of the can. Fly screen, 16-mesh, is soldered in place to cover each rectangular opening. A 2-inch circular hole is cut in the center of the top of the can. A closure rim for the culture jars is soldered in place in an inverted position encircling this hole. This permits a culture jar to be held in an inverted position on top of the can.

For oviposition purposes, woolen cloth with a light nap is placed on the outside surface of the can, covering the screened rectangular openings. The cloth is held in position with three inch-wide elastic bands extending around the circumference of the can. For convenience in fastening these bands, hooks are soldered to the can and eyes are sewn to the end of the elastic bands. A culture jar in which the clothes moth adults are emerging is placed in an inverted position over the hole in the top of the can where it is held in place by the screw rim. In placing the jar in this position, its former filter paper cover and retaining rim are removed. This step can be effected without loss of moths by jarring the adult moths to the bottom of the container and making the transfer quickly. The webbing produced by the developing larvae fastens the remains of the rearing medium to the culture jar. Thus the emerging adults have free access to the interior of the oviposition can. The inverted culture jar is illuminated continuously. This drives the moths to the shade of the oviposition can and prevents excessive oviposition on the wool remnants in the culture jar. The moths deposit their eggs through the screen on the woolen cloth which covers the openings in the side of the can. The cloth on which the eggs are deposited may be removed at any time and replaced by fresh cloth without escape of the moths.

The eggs are freed from the cloth by wrapping the cloth about any suitable cylindrical object and brushing the exposed side, bearing the eggs, with a stiff brush, such as a toothbrush. They are collected conveniently on a shallow tray. Infestation by mites is prevented by sieving the eggs through a 30-mesh sieve onto a 60-mesh sieve. Lint and foreign matter is collected on the 30-mesh sieve. The clothes moth eggs are retained on the 60-mesh sieve. Any mite eggs present pass through the 60-mesh sieve. This procedure has been described previously by Goddin (1939). The eggs obtained in this way are used for new cultures.

The rearing medium for a single culture jar consists of one strip of wool felt,[4] 14 in. long and 5 in. wide, and four strips of woolen filter cloth,[5] each 12 in. long and 4½ in. wide. Each strip of filter cloth is thoroughly dusted with dry powdered brewers yeast. Coleman (1932) has demonstrated the value of brewers yeast as

[1] Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University, Department of Entomology.

[2] Under a Fellowship at Rutgers University supported by Merck & Co., Inc.

[3] A suitable jar is the Kerr Wide Mouth Mason Jar.

[4] 70105, color 10 white, white all-wool felt. American Felt Co., 315 Fourth Avenue, New York City.

[5] Special filter cloth, H6997, Mechanical Felt and Textiles Co., 16 East 23rd Street, New York City.

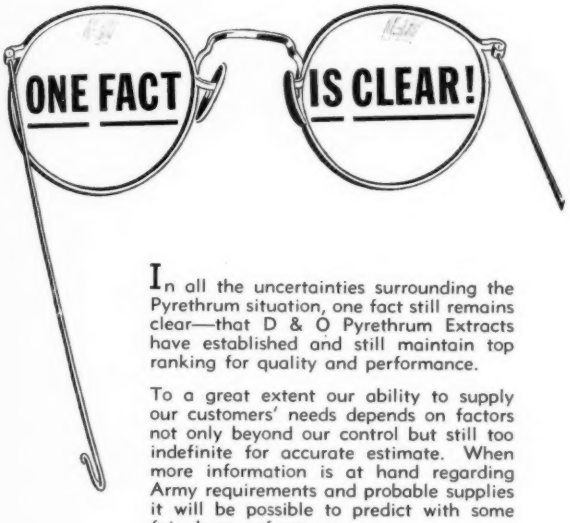
a dietary supplement for clothes moth larvae feeding upon wool. The above quantity of rearing medium is sufficient to rear 4000 larvae to maturity. The larvae feed most extensively on the filter cloth. The felt is provided as a skeletal structure and a reserve food supply. In establishing the cultures, approximately 4000 eggs are measured out in a centrifuge tube (0.1 cc.=approximately 2000 eggs). The strips of filter cloth are placed on top of the wool felt strip and the eggs are distributed evenly on the surfaces of the successive layers of filter cloth. The whole is then made into a loose roll, fastened with an elastic band, and placed in a culture jar. The jar is then closed with a filter paper top and set aside for development.

In practice two oviposition cages are kept in use constantly. On each of the three weekly collection days, the eggs are collected from the older cage, this cage is removed from oviposition, a collection of eggs is made from the younger cage with fresh oviposition cloths being supplied for it, and a new culture is placed on a cage for oviposition. The period of this change corresponds to the age differences in the developing reproduction stock. Thus each jar of reproduction stock is placed on oviposition at approximately the period of peak emergence and is maintained on oviposition for 4 to 5 days. The eggs are collected from the cloths three times weekly and new cultures are established at each egg collection. Old and unwanted cultures, and the eggs remaining on oviposition cloths are killed in an oven at 135°F. The time required for one man to carry out all the steps of procedure on each collection day is less than one hour.

MAINTENANCE OF BLACK CARPET BEETLE CULTURES. — The black carpet beetle cultures are maintained so that the age of each individual is known within the range of one week. The larvae are reared on a medium of dog food,[6] ground so that it will pass through a 30-mesh sieve. A portion of the stock is set aside regularly for reproductive purposes. When pupation begins in this stock at about 8 months of age, it is examined once a week for pupae. This examination is made by sieving the whole culture on a 24-mesh sieve. The larvae, pupae, and cast skins are retained on the sieve and the dog food medium passes through. The cast skins are blown rent from an electric hair drier. The off the sieve by means of the air current pupae are separated from the larvae by successively transferring from one sieve to another. At each transfer some of the larvae cling to the screen. After a number of such transfers all of the pupae will remain along with some of the larvae. The remaining larvae may be removed by hand-sorting aided by their negative response to light.

The pupae thus collected are placed aside in a container for one week. The adults from 20 cc. of pupae will produce about 10,000 larvae from one week's oviposition. The following week the adults which have emerged from the pupae are placed on a 24-mesh sieve and the cast pupal skins blown from them by the air current of the hair drier. The adults are then cleaned to ensure freedom from mite infestation. This is done by placing them in a pint jar along with a half-pint of heat-sterilized ground dog food. They are then mixed thoroughly with the dog food by rotating the container. The dog food is sieved off, carrying any mites or mite eggs with it. This procedure is repeated with a second portion of sterile food medium to

[6] Gaines Meal, Gaines Food Co., Inc., Sherburne, New York.



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ensure complete removal of the mite infestation.

For oviposition, the adult beetles from 20 cc. of pupae are placed in a pint jar which is loosely filled with 1.5-inch squares of supplemented wool filter cloth. This cloth is supplemented by spraying with an aqueous extract of brewers yeast until well moistened on both sides, after which it is permitted to dry. The extract of brewers yeast for this purpose is prepared by grinding brewers yeast powder with water in a ball mill for at least 12 hours, in the proportion of 1 gram of yeast powder to 10 cc. of water. After grinding in this way the extract is centrifuged or filtered and the resultant clear liquor used for supplementing the wool. Because the eggs are left on the oviposition cloths for hatching it is important that this supplement be provided on the cloths to supply the young larvae with a more satisfactory diet.

After one week of oviposition on the supplemented cloths, the adults are removed. They may be re-established for a second week of oviposition on fresh cloths or they may be discarded. The egg production during the second week is much reduced in comparison with that of the first week.

The cloth squares on which the eggs have been deposited are set aside for hatching. The eggs of the black carpet beetle, unlike those of the webbing clothes moth, are too fragile to be removed from the cloths without injury. Three weeks after the removal of the adults, the larvae have hatched from the eggs and are developed sufficiently to be handled without injury and to be seen readily with the naked eye. At this time they are removed from the oviposition cloths by gentle tapping and brushing with a camel's hair brush onto a tray from which they are counted into pint jars full of ground dog food as a rearing medium. One pint of dog food is sufficient for the rearing of 1000 larvae for four months. The jars are closed with a filter paper held in place by a screw-type closure rim. When the larvae reach the age of four months the old food is removed by sieving, the cast skins are blown away, and the larvae are re-established on fresh food. When the larvae retained for reproduction reach the age of eight months they are again provided with fresh food.

In practice all of the above listed steps are carried out once a week and a constant supply of developing stock is maintained. Cultures providing over 10,000 larvae per week for testing can be maintained under this system with about 6 to 8 hours of labor per week.

MAINTENANCE OF FURNITURE CARPET BEETLE CULTURES. — The furniture carpet beetle cultures are maintained so that the age of each individual is known within the range of one week.

The larvae of the furniture carpet beetle are reared upon a medium of woolen filter cloth supplemented with dry powdered brewers yeast.

The procedures used in rearing this stock are very similar to those used in the rearing of the black carpet beetle.

Once every week the pupae are collected manually from the rearing medium of the cultures set aside for reproduction which have reached the age of 3 months. One week later, when many of these have emerged as adults, they are placed on a sieve and cleaned by means of the air current of the hair drier. The adults are sorted from the remaining pupae by hand. These adults are cleaned to ensure freedom from mites in the same manner as used for the black carpet beetle and described in the preceding section. After cleaning, the adults are placed on yeast-supplemented woolen filter-cloth squares for oviposition in the same manner as with the black carpet beetle. After one week of egg deposition the adults are removed and the oviposition cloths set aside for the hatching of the eggs and the early development of the larvae. Three weeks after the removal of the adults the oviposition cloths are examined and the number of larvae present is estimated. The oviposition cloths bearing the larvae are transferred directly to strips of woolen filter cloth which have been dusted with dry powdered brewers yeast. One thousand larvae are placed on three strips of filter cloth, each 12 in. long and 4½ in. wide. The cloths are formed into a loose roll and placed in a jar for the development of the larvae. The jar is closed with filter paper as with the other species. When the larvae have attained the age of 8 weeks they are provided with additional woolen cloth for food.

By using the above procedures a constant supply of larvae for testing is maintained. The rearing of the furniture carpet beetle requires about the same time allotment as for the black carpet beetle.

TEST PROCEDURES. — The test method is based upon determination of the feeding activities of the larvae of the test insects upon the treated fabrics. Ten larvae of the selected test species of specific age are placed upon a sample of the fabric and permitted to feed for a period of 2 weeks. The weight of the fabric is determined prior to the test and again after the test. The loss in weight of the fabric during the test is used as the criterion of feeding damage. The details of the test procedure follow.

For the routine testing of possible protective agents, a sample of a standard test fabric[7] is treated with the agent by whatever method of application is indicated for the specific treatment. Upon completion of the application, the test samples are hung in the open in the laboratory for a period of at least three days to permit them to come to a moisture-content equilibrium with the atmosphere of the laboratory.

The samples for test are prepared by cutting circular patches, an inch and a quarter in diameter, from the treated fabric by means of a steel die on a hardwood block. Each sample is weighed on an analytical balance to the nearest 0.2 mg. After weighing, the test samples are placed in half-ounce ointment tins which serve as test containers.

Ten larvae of the specific age of the selected test species are placed upon each sample in the ointment tins. Normally three replicate tests are made for each fabric with each species of test insect. For rapid survey of a large number of materials the number of replicate tests may be reduced. Tests are always planned to include one series of replicates with the untreated woolen fabric.

With the webbing clothes moth, larvae of the age of 24 to 26 days from the date of egg deposition are used. These are obtained from the appropriate culture by removing the roll of rearing medium, spreading it upon a tray under illumination for a few minutes, and picking the test specimens from those which emerge from their webs. The larvae are handled with a pair of forceps which have a properly adjusted stop-block to prevent the points from closing together enough to injure the larvae. In this way the larvae are counted into the test containers.

With the black carpet beetle, larvae of the age of five months from the date of egg deposition are used. These are obtained from the appropriate culture by sieving off the dog-food rearing medium and blowing the cast skins off with an air current. The clean larvae are counted from a tray into the test containers with the aid of a camels hair brush.

[7] Style 4920. Pattern: Nat. Obtained from Franklin Mills through M. T. Stevens & Sons.

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Teacher — The sentence "My father had money," is in the past tense. Now, Mary, what tense would you be speaking in if you said "My father has money?"

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With the furniture carpet beetle, larvae of the age of two months from the date of egg deposition are used. These are obtained from the appropriate culture by brushing them from the woolen rearing medium, sieving off the faecal material, and blowing away the cast skins with an air current. The clean larvae are placed on a tray from which they are counted into containers with the aid of a brush.

Two weeks after the establishment of the larvae on the samples, the tests are examined. The larvae are removed with forceps and the mortality determined. The webbing of the clothes moth larvae and the cast skins of the carpet beetle larvae also are removed with forceps. The faecal matter and remaining foreign matter are removed by brushing with a medium-stiff artist's bristle brush. After the test cloth has been cleaned, its weight is determined on the analytical balance to the nearest 0.2 mg. The loss in weight of the cloth occasioned by the attack of the larvae is calculated. This weight-loss value is used as the criterion of the effectiveness of the treatment. The evidence of experience with this test indicates that a degree of protection, effective under practical conditions, is attained in samples which have lost only 8 mg. or less from the feeding of ten larvae for two weeks under the above-outlined conditions. Protection from attack by one species is not a positive indication of protection from the attack of other species. Experience has shown that a material must resist the attack of at least both the clothes moth larvae and the black carpet beetle larvae before it may be considered to be satisfactorily protected. Further investigation may show that the determination of the true protection of a fabric which require tests with still other species.

SELECTION OF SPECIES OF TEST INSECTS.—In a survey of the methods in use for the evaluation of the protection of treated fabrics to the attack of clothes moths and carpet beetles, it was found that many investigators favored the use of black carpet beetle larvae as test insects. A number of reliable research workers, however, advocated the use of larvae of the webbing clothes moth for this purpose. Some workers suggested that furniture carpet beetle larvae were superior as test insects for these evaluations. In most cases the investigators considered that the resistance of a fabric to the attack of the favored species constituted an indication of effective protection against all species. In view of this wide difference of opinion it was decided to place all three of the species under test upon similarly treated fabrics.

Many materials, covering a wide

Table 1.—Average loss in weight (mg.) of treated woolen fabric from the feeding of ten larvae for two weeks.

Fabric Treatment	TEST SPECIES		
	Webbing Clothes Moth	Black Carpet Beetle	Furniture Carpet Beetle
Commercial product 1	4.5	11.2	
Test Product 1 (Benzyl disulfide)	0.4	17.6	
Test Product 2	7.8	20.9	
Test Product 3	16.0	8.8	
Test Product 4 (Cetyl diethylamine hydrobromide)	29.8	2.2	
(Cetyl diethylamine hydrobromide + 4 washes	75.0	5.7	
Test Product 5	17.2	2.9	
Test Product 5 + 4 washes	39.0	5.8	
Test Product 6	50.4	2.1	
Test Product 6 + 4 washes	70.6	5.8	
Derris resinate	2.8	0.3	
Derris resinate + light exposure[1]	35.5	3.8	
Derris resinate + 4 washes	9.2	0.5	
Derris resinate + 4 washes + light exposure[1]	42.4	5.4	
Derris resinate + light exposure[2]	21.4	0.3	2.6
Commercial product 2	1.4	0.2	2.1
Commercial product 2 (one-half recommended application)	3.6	6.7	12.4
Test Product 7	44.8	3.5	25.5
Untreated	60.0[3]	20.0[3]	30.0[3]

[1] Exposed for 72 hours in **Atlas Fade-ometer.**
[2] Exposed in laboratory illumination for one month.
[3] Approximate values for the untreated clean woolen fabric.

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range of characteristics, have been examined for effectiveness as fabric-protective agents using the larvae of both the webbing clothes moth and the black carpet beetle as test insects. Unfortunately, circumstances were such that only a limited number of tests have been made using the larvae of the furniture carpet beetle. In the work to date, 63 materials have been found to give adequate protection against the black carpet beetle larvae and to be ineffective against the webbing clothes moth larvae. Five materials have been found to give protection against the webbing clothes moth larvae but to be ineffective against the black carpet beetle larvae. In the limited number of tests made with the furniture carpet beetle larvae, one material was found to be ineffective against both of the others. There was evidence to show that the response of the larvae of any one species to any specific treatment is not necessarily indicated by the response of either of the other species. Table 1 presents data representative of that upon which these claims are based.

It is apparent from these results that effective protection of a fabric against the attack of any one of the three test species does not necessarily indicate that the fabric will be equally well protected against the attack of the other species. It is concluded that a reliable evaluation of protection must include tests with larvae of at least both the webbing clothes moth and the black carpet beetle. It is probable that tests also should be made with the larvae of the furniture carpet beetle. It is possible that other species of clothes moths and carpet beetles may have to be considered in tests for the evaluation of protection against attack by insects of this type. For practical purposes the use of two many species is prohibitive because of the time consumed in the maintenance of cultures and in testing.

CRITERIA FOR EVALUATION.—Many criteria for the evaluation of the extent of insect attack upon treated fabrics have been used by different investigators. These have ranged from visual examination to complex manipulations with the excrement of the attacking larvae.

Visual examination to determine extent of feeding is a sound standard of evaluation. It has, however, the inherent disadvantage of involving human judgment and capacity for observation. This makes it unsuitable for the comparison of the results obtained by more than one investigator and renders it susceptible to variation from time to time. For these reasons it is not considered the most suitable method for the determination of the extent of insect attack.

The measurement of the amount of faecal matter deposited by the larvae is not a suitable method for the estimation of insect damage in these tests for it is difficult to collect all of the faecal matter when using webbing clothes moth larvae for the test. Thus this criterion was eliminated from consideration in this investigation because it did not appear suitable for use with all the species of test insects.

Of the various methods for measuring insect damage which were used in the early phases of this investigation, the actual determination of the loss in weight of the sample resulting from the feeding activity of the larvae is most suitable. This is obtained as the difference between the weight of the sample before the test and the weight of the sample after the test when it has been freed of faecal matter, webbing, and cast skins. This value represents the total damage to the fabric inclusive of the portion which is ingested by the larvae and the portion that is detached from the fabric by feeding activity but not ingested. It is readily determined, accurate, and uniform from test to test.

For the most satisfactory use of this measure of feeding damage, controlled conditions of temperature and humidity are desirable. The weight of the fabric samples will change with changing humidity conditions. In laboratories in which the humidity is not controlled this variation in weight of the sample can be determined by the use of check samples of fabric which are not subjected to insect attack. The variation in weight of the test cloths can be calculated from the weights of these check cloths at the beginning and end of the test period. A correction factor to compensate for the change in weight of the test cloths can be obtained and applied to the weight-loss values. Temperature variations have no more influence upon tests made by this method than upon those made by any other method. Thus this criterion for determination of the extent of insect attack may be adapted for use in the laboratories where the temperature and humidity conditions are less rigorously controlled.

The upper limit of weight loss for effective protection has been set at 8 mg. resulting from the feeding of 10

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larvae of the required age for a period of 2 weeks. Further studies are necessary for absolute establishment of such a value. It may be found that a higher weight-loss value can be permitted after an extensive study of the protection given by various agents under more natural conditions of infestation. The present limit of 8 mg. was selected after many tests had been made in which visual examinations supplemented the weight-loss determinations. The values obtained from tests of four commercial treatments are shown in table 2.

Table 2.—Average loss in weight (mg.) of treated woolen fabric from the feeding of ten larvae for two weeks.

	TEST SPECIES	
Fabric Treatment	Webbing clothes moth	Black carpet beetle
Commercial product #1	4.5	11.2
Commercial product #1 +4 washes	4.9	8.8
Commercial product #3	11.9	7.3
Commercial product #3 +4 washes	11.4	8.6
Commercial product #4	6.4	5.4
Commercial product #4 +4 washes	52.8	13.4
Commercial product #5	5.5	4.2
Commercial product #5 +4 washes	59.1	9.4

AGE OF TEST SPECIMENS AND LENGTH OF TEST PERIOD. — The age of the larvae of the webbing clothes moth for use in these determinations was chosen on the basis of tests which showed that the most extensive feeding damage was done by larvae of 3 to 5 weeks of age. 24-day-old larvae are also sufficiently large to be handled easily and without injury. The 2-week test period was chosen arbitrarily as the longest convenient period that the larvae of this age could be kept under test without excessive pupation.

With the larvae of the black carpet beetle, the age of 5 months was selected as the testing age on the basis of the results of tests which showed that these were the youngest and smallest larvae that gave feeding damage on fabrics which approached the maximum given by any larval form. The length of test period was chosen as 2 weeks because tests had shown that the most of the damage done to fabrics under test conditions for 6 weeks was done in the first 2 weeks. In tests of 18 different treatments, an average of only 30 per cent more damage was done in 4 weeks than had been done in 2 weeks.

TEST CONTAINER AND TEST SAMPLE.—The half-ounce ointment tins were selected arbitrarily as the test containers. They have the advantage of being so cheap that it does not pay to wash them. Thus each may serve as a storage container for its sample at the completion of the test. Investigators who wish to use slowly volatile materials as protective agents will probably find that this container does not permit sufficient ventilation. It has been quite satisfactory, however, with the materials encountered in this investigation. As an alternative type of test container, a one-ounce glass ointment pot is suggested. As a cover for this type of cage, filter paper or a circle of 60-mesh screen, held in place by an open-centered screw top, may be used.

The circular test sample of 1.25 in. diameter was likewise adopted arbitrarily on the suggestion of other investigators who had found it satisfactory. A sample of this size was adequate, with any of the untreated fabrics used, to support the feeding of 10 larvae for 2 weeks without being completely destroyed.

FOOD SUPPLEMENTS ON TEST SAMPLES. — It has already been stated in this paper that clean wool alone is not a satisfactory diet for the normal development of larvae of the

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webbing clothes moth or the black carpet beetle. When it is desirable to present the most rigorous conditions of attack, the test fabrics may be supplemented by spraying them with an aqueous extract of brewers yeast prior to testing. The preparation of this extract has been described earlier in this paper in the section dealing with the maintenance of cultures of black carpet beetles. This supplement will increase markedly the intensity of attack on all fabrics except those protected by the most effective agents. The inclusion of this treatment in routine testing in search of new protective agents is not recommended as it is too time-consuming. It is believed, however, to have value for placing a material under the most rigorous conditions of test in the final evaluation of a promising treatment.

SUMMARY. — Procedures are described for the maintenance of laboratory cultures of the webbing clothes moth, the black carpet beetle, and the furniture carpet beetle on a known-age basis. A method is outlined for the evaluation of the protection of fabrics against clothes moth and carpet beetle attack by subjecting them to the feeding of larvae of the above-listed species under carefully controlled conditions. Data are presented to show that resistance of a fabric to the attack of the larvae of any single species does not assure that the fabric is effectively protected against the attack of other species.[8]—12-17-41.

[8] The author wishes to express his appreciation to Dr. T. J. Headlee of Rutgers University and Dr. R. T. Major, Dr. W. H. Engels and Dr. T. J. Webb of Merck & Co., Inc. for their kind interest and advice. The treatments of woolen fabrics were made by Messrs. C. S. Treacy and J. E. Newman of Merck & Co., Inc. Mr. A. Buzas and Miss D. L. Collins assisted with the experimental work.

LITERATURE CITED

Colman, W. 1922. Effects of yeast on clothes moth larvae. Jour. Econ. Ent. 25(6): 1242.

Goddin, A. H. 1939. Method developed for ridding clothes moth cultures of predacious mites to obtain uniform larvae and adults. Du Pont Agr. News Letter, 7: 52-3.

—Journal of Economic Entomology, April, '42

Additional Patents Relating to Pest Control

(Continued from Page 19)

An insecticide contains as its essential active ingredient a mixture in the form of a dust of hard rubber, nicotine alkaloid and cottonseed oil.

2,286,912 (June 16, 1942; appl. June 30, 1941). MOUSETRAP. Oliver Warren Johnson, Geneva, Ohio—one-half to Jay Carleton Kelley, Geneva, Ohio—one-half to Jay Carleton Kelley, Geneva, Ohio.

2,287,235 (June 23, 1942; appl. June 27, 1940). PEST CONTROL. Robert B. Flint, Wilmington, Del., and Frank H. Kaufert, St. Paul, Minn.—E. I. du Pont de Nemours & Company, Wilmington, Del. A pest control composition useful for controlling fungi, insects, bacteria and like organisms contains as an active ingredient a cupric chelate of an ortho-carbonyl phenol in which the carbonyl substituent is selected from the class consisting of hydrogen and a monovalent aliphatic radical which characterizes the carbonyl group as a carbonyl group of a ketone or ester.

2,287,249 (June 23, 1942; appl. June 27, 1940). CHLORINE DERIVATIVES OF BENZYL PHENYL ETHER. Harold S. Holt, Wilmington, Del.—E. I. du Pont de Nemours & Company, Wilmington, Del. The patentee claims a polychlorinated benzyl phenyl ether selected from the class consisting of trichlorobenzyl phenyl ether, trichlorobenzyl, o-tolyl ether, trichlorobenzyl 2-acetyl phenyl ether, and trichelorobenzyl 4-tertiary-amyl phenyl ether. These new chemical compounds are particularly adapted for preserving keratinous textiles and like fabrics against attack by clothers moths and their allies.

2,287,912 (June 30, 1942; appl. Apr. 5, 1940). GARMENT BAG. John J. St. Laurent. Chickasaw, Ala.—International Paper Company, New York, N. Y.

2,288,101 (June 30, 1942; appl. June 15, 1940). ADJUSTABLE DUSTER NOZZLE. John Mayer, Hastings, Minn.—H. D. Hudson Manufacturing Company, Chicago, Ill.

2,288,312 (June 30, 1942; appl. Apr. 4, 1938). SPRAY TANK. William R. Brown, Chicago, Ill.—Brown Corporation, Chicago, Ill.

We don't know why . . . but there is a town named "Rat" in the State of Missouri. Odd, but true.

"With the Colors"

We are pleased to announce that Mr. Toger Lessard, connected with the Service Department of our Montreal Office for a number of years, has recently joined the ROYAL CANADIAN AIR FORCE.

John E. Huls and Mark Manyil, employees of Oser Exterminating Co., Denver, Colorado, are now employed to serve in the Armed Forces.

James C. Walker, former owner Acme Contracting Co., and Acme Control Co., in University City, Mo., is stationed at the Aleutian Islands as a major in the U. S. Engineer Corps. While there he will be in charge of building air bases and harbor facilities for the army. After being commissioned as a major in the Engineering Corps about five months ago, Mr. Walker was in charge of constructing a large air field at Vichy, near Rolla, Mo. Shortly after completion of this project he was transferred to the Mountain Division with headquarters at Fort Douglas, Salt Lake City, Utah. In civilian life Mr. Walker also served as bandmaster of the Maplewood Salvation Army Band and was very active in Salvation Army work.

Durable Fence Posts

Most farmers no longer have durable wood available for use as fence posts. Non-durable second growth wood must be chemically preserved to make it last. Recently, a new and relatively simple method, known as the trough method, was developed at Clemson College, S. C., for impregnating freshly cut fence posts with water-soluble preservatives. In these experiments, decay and termites caused the destruction of untreated posts within two years, whereas the posts treated with zinc chloride are perfectly sound after more than three years and have lasted considerably more than ten years longer than similar untreated posts.

—Texas Farming & Citriculture, June, 1942.

NOW! That most chemicals formerly used in Rat Control are either unavailable or becoming more difficult to obtain . . .

FOR RODENT CONTROL

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October 26th to 28th

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MOTHPROOF LIQUID THAT "PENETRATES"

Now that woolen conservation is so vital to "UNCLE SAM'S" war program, there is still greater need for Moth protection. You can help "America" protect its valuable woolen materials by selling "PER-MO" Moth-proofing Service. Full particulars and prices first letter.

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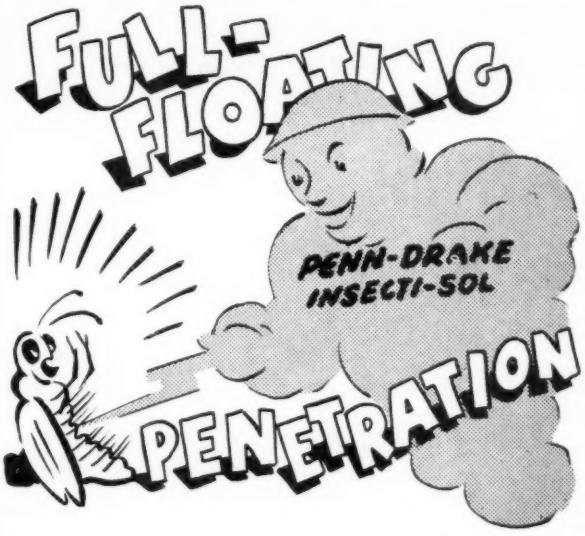

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***in* KILLING RANGE . . .**

Penn-Drake INSECTI-SOL, the ideal solvent base, makes your insecticides float longer, penetrate deeper and thus attain maximum toxic effect. Crystal-clear and permanently odorless, it evaporates entirely after toxic effect of your preparation is completed . . . contains nothing to stain or soil clothing, drapes, rugs, etc.

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The Early Use of Sodium Fluoride as an Insecticide*

By **H. H. SHEPARD**, *Division of Entomology and Economic Zoology, University Farm, St. Paul*

THE value of sodium fluoride as an insecticide first became well-known to entomologists through a farmers' bulletin on cockroach control by C. L. Marlatt of the United States Department of Agriculture, and a technical bulletin on contact insecticides by G. D. Shafer of the Michigan Agricultural Experiment Station, both published in 1915. Several references, however, indicate that commercially sodium fluoride was recognized in this field some years earlier. The first reference to it as an insecticide is in a British patent by Higbee in 1896, which covered the use of several fluorides and fluosilicates both for cockroach control and for some pests of agricultural crops. Only a short time later it was stated in the United States that sodium fluoride put up in tin cans as a cockroach paste was sold extensively (H. B. Baldwin, Jour. Amer. Chem. Soc. 21: 517-521, 1899).

Cockroach powders containing sodium fluoride were mentioned in 1911 by Hickey (Massachusetts State Board of Health Bulletin 6: 341-343), who recorded the death of a girl and the severe poisoning of other persons through the mistaken use of these materials for Rochelle salt. Samples from the containers, which were without poison labels, showed from 1 to 62 per cent sodium fluoride. In 1912 M. F. Gates (United States Naval Medical Bulletin 6: 212-214) found cockroaches were eliminated quickly, cheaply and completely from ships and houses by the use of sodium fluoride, "the active ingredient of the best 'cockroach exterminators' on the market." He stated that the insects did not feed on the powder but consumed it while cleaning their feet and antennae, and warned that the fluoride must be kept dry for it to adhere to the insects. He also noticed that there was a decrease in the prevalence of the little red ant on shipboard after the fluoride had been used. As a direct result of the article by Gates, sodium fluoride was recommended by Lounsbury in 1914 for cockroach control in South Africa. It was included among chemicals tested as housefly larvacides by the United States Department of Agriculture in 1914. J. N. Stanton and M. Kahn (Jour. Amer. Medical Assoc. 65, p. 1985) recorded in 1915 a case of severe poisoning of a small girl who accidentally ate a small quantity of "Peterman's Roach Food," which according to the label contained 40 to 50 per cent sodium fluoride. Correspondence with the present successors to the Peterman Company reveals that the "Roach Food" formula contained sodium fluoride prior to 1914; how much earlier cannot be said although it is stated the "Roach Food" was "invented and established in 1873," according to an early letterhead.

It appears from these references that sodium fluoride as an insecticide received the attention of medical authorities before entomologists were very much aware of it. None of the leading books on insect control contained reference to sodium fluoride until about 1920. Toxicologists, however, were also slow to realize the dangers from taking sodium fluoride internally. The compound was commonly used as a food preservative in the latter part of the 19th century and for a few years following 1900. At that time small amounts of sodium fluoride were added to bottled beers among other things. Although severe poisoning did not occur and chronic symptoms were seldom recognized, F. Schwyzer (New York Medical Journal 24: 1-6, 1901) showed one of his patients to be suffering from the effects of this preservative in beer—of which the patient was consuming up to three cases of 24 pint bottles a week! The use of sodium fluoride as a preservative appears to have fallen into disrepute early in the century, but the dangerous character of the compound was not recognized until more recently. Quite a few human fatalities from its consumption in error for laxative or for baking powder have been recorded from 1882 to the present time, but in the 1923 edition of a widely used textbook on toxicology it is actually stated that no fatality from this compound had been reported at that time! Fortunately the attitude toward sodium fluoride is now quite generally changed; poison labels and warnings are attached to containers; even better, coloring matter is frequently added to the white powder—all of which indicates not merely official compulsion but also individual recognition of the importance of guarding the public safety.

Beginning in 1915 entomologists soon found uses for sodium fluoride in the control of insects other than cockroaches. It was suggested for use against silverfish in 1915 (Marlatt), reported in 1916 as a new and effective control for poultry lice (Bishopp and Wood) and for ants (Gibson), used in the treatment of wood pulp products for termite control in 1916 (Snyder), and reported effective in 1917 for dusting and dipping domestic animals infested with biting lice (Bishopp and Wood). Lloyd (1919) used sodium fluoride as the killing agent in a liquid poison bait to attract tomato moths in greenhouses in England. In 1922 Fulton found it an effective poison in baits for the control of the European earwig. In South Africa Ripley (1924) reported it effective also in poison baits for cutworms and the brown locust. With its development for use as a dust, a dip, or the poisonous ingredient of liquid or wet-mash baits, sodium fluoride may be considered to have come of age in the field of insecticides.

SPECIAL OFFER

A few Joke Books on hand

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A Splendid Gift for the Boys in the Army Forces or Customers

*Paper No. 469 Miscellaneous Journal Series, Minnesota Agricultural Experiment Station, St. Paul.

WHAT'S NEW IN PEST CONTROL-PERSONALS

THE PACKAGING INSTITUTE, INC. will hold its annual convention on November 5th and 6th, 1942, at the Hotel New Yorker, New York, according to announcement made by the Executive Committee of the Institute. Packaging in Wartime will be the subject of the program discussions.

The National Chemical Exposition will be held at Hotel Sherman, Chicago, Ill., November 24-29. An attendance of 2,000 is anticipated.

—Guadalcanal, scene of heroic doings of the United States Marines in the Solomons, is good for little except coconut oil, and, besides it is infested with rats as big as cats.

Elm-leaf beetles are reported as a nuisance in many homes that are close to elm trees. A pyrethrum spray will paralyze the beetles, after which they can be swept up and destroyed.

"STAY IN THE HOUSE" was the advice proferred by John Paterson, superintendent of the Bergen County (New Jersey) Extermination Commission, when people asked him for an antidote to the August super mosquito-blitz to which they were being subjected.

CARTOON IDEA: A long line of people beating a path through a forest to the door of a hermit who tells them: But I've given up making mouse traps.—*The Lyons Den, N. Y. Post.*

A single strain of blow flies has been raised at Ohio State University representing 200 generations of those insects. It's the equivalent of 4,000 years of human beings' history.

—*John O'Hara, N. Y. Post.*

Nazi Predicts Ersatz Rats Will Accompany Victory

Confidence in victory remains general in Germany, reports a Swiss citizen who has just returned from a visit to Berlin. Yet the current question in all parts of the country is: "When do you think the war will end?"

One Berlin wit made an answer that is now going the rounds: "The war will end when the British are reduced to eating rats, and by that time we shall be eating some substitute for rats discovered by our chemists."

The story is told in the National Zeitung of Basle.

Now that the snows are beginning to fall in Russia, Johannes Steel revives the story of the man and wife who lived for many years in a house located on the Russian-Poland border. Some years ago six Soviet officials arrived there, measured the house and told the wife: "Your house is definitely in Polish territory" . . . She reported this to her husband,, who expressed much delight. "But what defference should that make to you?" asked his wife. "We've been living here for 50 years. Why should a ruling that our house is in Poland make a difference?" . . . "Just bear in mind," her husband replied, "—those Russian winters."

—*From the Lyons Den, N. Y. Post.*

The John Potts Linns'—Yes sir, Rhea and John Linn were more than surprised on their 25th wedding anniversary recently as 135 of their friends barged in on them. John, as Past Master of his Masonic Lodge, found that the brethren added a double surprise by bringing to Omaha John's mother and father and sister and her husband. The remarriage was carefully performed and the usual wedding cake of five tiers served as a reminder that a bonafide wedding had taken place. A handsome Silver Service Tray with its complements of coffee urn, sugar bowl and creamer will continue to remind the Linns of the big occasion. The pest control industry joins in wishing you continued happiness and will be with you on the 50th.

Dehydrated Vegetables Need Bug-Proof Holders

The new dehydrated vegetables which American soldiers are getting are so good, the American Chemical Society was told recently, that the bugs will even eat through asphalt bags to steal them.

Cartons, cellophane, nothing except metal or glass keeps out the insects. No substitute for metal or glass has been found, but chemists are experimenting.

If it's new ideas you want for the management of your business during the war emergency, the N.P.C.A.'s 10th Annual Convention at the Hotel William Penn, Pittsburgh, Pa., October 26-28, is the place to pick them up; if it's the Axis you want to help defeat, then jump on the bond-wagon and buy war bonds regularly.

Inoculate Japanese Pest

Many home owners in Connecticut in the last few weeks have been puzzled by patches of white powder on their lawns. Those who were attracted to their door or window by a clicking noise, made by the corn planter used to spread the material, learned that it was a talc containing spores of the milky disease of the Japanese beetle.

To the resident's comment, "but I've already used arsenate of lead on my lawn this season," John C. Schread of the State Agricultural Experiment Station at New Haven, who is in charge of the work, explains that the milky disease is an entirely different method of control from arsenate of lead. Instead of being a poison for the grubs, it is an attempt to inoculate them with living bacteria which give them the fatal disease.

The resident is assured that the spore dust is not poisonous to birds or household pests.

—*N. Y. Times.*

Federal Trade Commission Actions

(Stipulation 03021) (Rat Poison)

Queen Ant Control, Inc., a corportion, Columbus, Ohio, vendor advertiser, was engaged in selling rat poison designated Q.A. Ratabs.

In a stipulation filed and approved by the Federal Trade Commission the vendor-advertiser agreed, in connection with the dissemination of future advertising, to cease and desist from representing directly or by implication:

(a) That the use of Q.A.Ratabs will remove all rats or will prevent reinfestation of premises;

(b) That every rat will eat Q.A. Ratabs;

(c) That rats eating this poison go outside to die;

(d) That this product is completely safe or harmless to children, pets, livestock or poultry;

(e) That this product is an effective poison for mice.

The said Queen Ant Control, Inc., further agrees not to publish or cause to be published any testimonial containing any representation contrary to the foregoing agreement . . . A-7-6-42.

(Stipulation 03023) (Rat Poison)

Robert H. Harkins, an individual doing business as Nott Manufacturing Company, 87 Frankfort St., New York City, vendor-advertiser, was engaged in selling rat poisons designated Rat-Not and Rat-Nots.

In a stipulation filed and approved by the Federal Trade Commission the vendor-advertiser agreed, in connection with the dissemination of future advertising, to cease and desist from representing directly or by implication:

(a) That either of these products is recommended by the Department of Agriculture;

(b) That Rat-Not or Rat-Nots will drive outdoors to die those rats which are induced to take them;

(c) That either of these products assures the complete extermination of rats;

(d) That either of these products is harmless to humans, dogs, cats or livestock.

The said Robert H. Harkins further agrees not to publish any testimonial containing any representation contrary to the foregoing . . . A-7-9-42.

Stipulation No. 3530—Rat Embalmers

Felix Girard Co., Inc., 2013 Fourth Ave., South, Minneapolis, Minn., engaged in the manufacture of insecticides and a rat and mouse poison designated "Red Cross Rat and Mouse Embalmer," has stipulated with the Federal Trade Commission, in connection with the sale and distribution of its products, to cease and desist from use of the word "Embalmer" or words of like meaning as descriptive of a product which, when fed to rats or mice, will not embalm their bodies, that is, preserve such bodies and prevent their decay; representing by statements such as "World's Leading Rodenticide" that their product leads all other rat and mouse poison throughout the world either in volume of sales or merit; use of the statement "Each pound of the Embalmer is guaranteed to clear 5,000 square feet of infested floor space," or any other statement or representation to the effect that it can be depended upon to destroy or eradicate all rats or mice in or from buildings or the floors or walls thereof; use of the word "Guaranteed" or any words of similar meaning in connection with the advertising or sale of its product, unless, whenever used, clear and unequivocal disclosure be made in direct connection therewith, of exactly what is offered by way of security; use of any guaranty unless strict and complete performance be made therewith; and use of any unwarranted statement or representation having the capacity or tendency to disparage or discredit competitors.

LOCAL ORGANIZATION NEWS

Pittsburgh Pest Control Operators

A group of 20, including Mr. Wm. O. Buettner, Secretary, National Pest Control Association, have just put the finishing touches on the program for the Tenth Annual Convention, October 26-27-28. The Pittsburgh PCOs met at William Penn Hotel Friday, September 25th. We in Pittsburgh feel it will be interesting to all.

The speakers' subjects have to do with the conditions as they are today and what we can expect for the duration of the war. Many of the speakers are taking time from their very important war jobs to relate these conditions and expectations. Surely all should take time out to come and hear what is expected of us in this all-out war.

The program and entertainment will be entirely different than anything we have ever had. Service letters have told you the convention will open Monday morning, October 26, with the unfurling of the PCI Service Flag. The Convention will close on Wednesday evening with the Banquet being held in the beautiful "Chatterbox." The music will be furnished by nationally known Bob Astor's Orchestra. Those who care to remain can dance until 2 A. M., if they wish.

Oh yes, don't forget the Ladies. We want them all to come and enjoy themselves, meeting old acquaintances and making new friends. We have had many a headache arranging the Ladies' program. Many factories and buildings have been closed for the duration. Buses cannot be used for sightseeing, but we have arranged an interesting program. If the ladies will bear with us and bring comfortable shoes for the little walking that will be necessary, we will take them to the famed and beautiful Civic Center. This Center has the largest building under glass in the world and it contains a rare and beautiful collection of orchids. Then there is the tallest school, the University of Pittsburgh, Carnegie Museum with its fine collection of Art, Soldiers and Sailors Memorial, and many others.

COME, SEE, HEAR, LEARN. Pittsburgh awaits you.

New York Pest Control Association

The regular meeting of the New York Pest Control Association was held at its headquarters, 366 Madison Ave., New York City, on September 29th. President "Bill" Buettner presided. It was a closed meeting of the Association members only with representatives of 36 firms in attendance.

The discussion had mainly to do with a policy with regard to the labor situation and other matters related to the conduct of daily business affairs.

Wedding Bells—September 28th was the big day for Sgt. Technician Irvin E. Simon whose hand was accepted by Mimi Harron of Washington, D. C. The wedding took place in Washington, D. C. Irvin E. Simon was associated with his brother, Justin Simon, General Exterminating Company, Inc., of Brooklyn, N. Y., before he joined the Army. At the present time Irvin is attached to the 45th General Hospital, Camp Lee, Va. Our best wishes.

Hooker Electrochemical Company and employees of the Niagara Plant, Niagara Falls, N. Y., were awarded the Army-Navy Production "E" Award on September 8, at a special ceremony at their plant. Congratulations!

California Structural Pest Control Board

The structural pest control law of California was the subject of a conference between Governor Culbert L. Olson and members of the California Structural Pest Control Board, held recently in Los Angeles.

The Governor expressed himself as much interested in the effectiveness of the present law which was revised extensively during the last session of the state legislature and was approved by him. Members of the Board assured the Governor that the law is working very satisfactorily and that the rank and file of pest control operators throughout the state who desire regulation as a protection against unlicensed and unethical operators have indicated their approval of it, also.

Stating his belief that California will continue to lead the nation in the pest control industry and in the standards of practice of the vocation Governor Olson complimented the Board for the efficient manner in which they have carried out their work. The Governor declared that numerous letters of praise received by him from citizens throughout the state in regard to the Board's work have given him a great deal of pleasure.

The Fat Rats of Buffalo

Buffalo residents are "throwing into their garbage cans enough food to feed properly a city of 10,000," and the rats are becoming fat and more numerous because of it, City Health Commissioner Fronczak said.

"There has been a tremendous increase in the amount of food wasted since so many people have been getting high wartime wages and buying extravagantly," Dr. Fronczak said.

—*N. Y. Post.*

Insecticide Mist

An oily mist which kills flies, mosquitoes, wasps, hornets, ants and many other insects, but is declared to be harmless to human beings, was described to the American Chemical Society recently. It is produced by a spray.

Lyle Goodhue, of the United States Bureau of Entomology and Plant Quarantine, Beltsville, Md., said the main advantage is that the oil mist floats in the air for a long time.

It is made of pyrethrum extracted from chrysanthemum and sesame oil. Other combinations are possible. He said the Navy is using it in five-pound tanks.

—*N. Y. Herald Tribune.*

War Worker: Oscar, a cat, is chief rat catcher at the Hyde Park, Mass., plant of the B. F. Sturtevant Co. Cats as official rat catchers are old stuff, but Oscar has a claim to distinction: He is registered with the FBI as a trustworthy hand and is equipped with the bona fide badge that adorns his collar.

Members of the California Structural Pest Control Board are pictured above in recent conference with Governor Culbert L. Olson. Reading, left to right, are Allen Mathews, registrar and secretary; E. O. Corson of Berkeley, president; Governor Culbert L. Olson; John J. Martin of San Diego; John J. Gould of San Francisco; and David G. Rennie of Los Angeles, vice-president.

There is one vacancy on the Board due to the recent resignation of Harold Grundy of Long Beach.

Rodenticides—Past, Present, and Future

(Continued from Page 11)

within two seasons unless substitute field rodent poisons can be found.

It is hard to look forward and say what rat poisons will be available in any quantity in another two years. The entire situation looks rather unfavorable with regard to most, if not all, of the substances which have been used in the past and which are being employed more or less successfully now. Aid can be given to the domestic search for thallium by the Bureau of Mines and the Geological Survey. Studies can be instituted to grow selected strains of red squill in this country. Priorities for phosphorus and for electrolytic zinc to be used in rodent poison can be requested, allocation of arsenic and barium carbonate for rodent control to protect the public health against rat borne diseases and to stop damage to buildings, food stuffs and essential materials, can be justified, and attempts can be made to secure cargo space to ship strychnine-bearing nux vomica beans. With all of these actions being taken to insure a reasonable supply of rat poisons, there is no assurance that some more important need for these materials may not arise and reduce the chance of the pest control industry obtaining desired quantities. Studies are under way in the Fish and Wildlife Research Laboratories to find new and different raticides.

A discussion of rodenticides would be incomplete without reference to gases. The cyanides, chlorpicrin, and carbon disulphide have been "old stand-bys" for many years in locations where they can be used safely. So far they have not been on lists of restricted or "short" chemicals. The acute shortage of chlorine will soon make chlorpicrin hard to get. Methyl bromide is in a restricted group and is practically off the market. Also with gasoline rationing making itself felt, the practice of "gassing" rodent holes with automobile exhaust fumes is less popular.

There would be some satisfaction in the belief that certain gases will always be available, but even that is a hazardous surmise. Changes in the materials situation are occurring almost overnight. Though some substitutes for essential poisons may be found in the very near future, it will take time to try them out under a sufficiently wide variety of conditions to permit recommending them. There can be no doubt but that rat work in many places will be handicapped by shortage of control chemicals. Concerted efforts to find satisfactory substitutes for the materials which may be entirely unobtainable and a campaign to prove to the proper rationing authorities that it is proper to allocate materials to rodent control work, are two action programs of vital importance in this emergency.

Orange-Yellow Light Is Advised For Unscreened Porch

Schenectady, N. Y.—(U. P.)—Night flying insects, including the mosquito, are color conscious, industrial research workers have found.

If you use an orange-yellow light bulb on your unscreened porch at night, you won't be bothered by insects as much as you will be if the light is bluish, the investigators discovered.

They concluded insects were most attracted by bright blue light, such as emitted by mercury lamps, and preferred red lights least of all.

The investigators carried out their experiment by stringing up colored bulbs to which insect traps were attached.

FOR HIGH-KILL RESULTS USE

HOPKINS' PYRO-TOX

(TRADE-MARK)

HIGH-TEST PYRETHRUM EXTRACTS IN CONCENTRATES OF

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City Declares War on Rats

With city officials and police forming the spearhead of the attack, a city-wide campaign of rat extermination is planned, enlisting the aid of civic groups and the public, Director of Public Welfare Henry S. Caulfield announced.

It is hoped the extermination crusade can be organized throughout the city by ward, precinct and block units, with the assistance of such organizations as the Boy Scouts, the Woman's Emergency Health Committee of St. Louis, women's clubs and other groups, Caulfield declared.

Preliminary plans were made at a two-hour meeting in Caulfield's office attended by Chief of Police John H. Glassco, Street Commisioner Henry W. Dawson, Richard Kent, superintendent of garbage collection; Ernest H. Paffrath, assistant sewer commissioner; Dr. Joseph F. Bredeck, health commissioner, and John Buxell, chief of the sanitary section of the health department.

Caulfield described the rat problem as acute and a serious menace to property and health. Surveys are being made by police of spots in the city where rats are causing the most trouble, Chief Glassco reported.

"The officials present agreed that this should not be a mere sporadic campaign," Caulfield said, "but should result in a permanent organization having as its purpose the elimination of the rat nuisance. Another meeting has been held to make further plans."

The primary step in exterminating rats, Dr. Bredeck explained, is to keep ash pits clean and eliminate other accumulations of rubbish where rats breed.

St. Louis, he said, is the only major city in the United States without a public rubbish collection service. An ordinance providing for rubbish collection is on the city statute books, but is not effective because no appropriation for that purpose has been made for a number of years.

A bill introduced into the Board of Aldermen several months ago to make an appropriation for rubbish collection was shelved by the Board of Estimate and Apportionment. The reason given for sidetracking the bill was lack of city funds. It was pointed out by proponents of the bill, however, that service charges could make the plan self-sustaining.

—*St. Louis Globe-Democrat.*

GAS MASKS

Like many other essential articles which depend upon rubber for their make-up, gas masks are becoming increasingly difficult to obtain. Meanwhile those PCOs who own gas masks will be well advised to give them the best of care and preserve them in every way so that they will last as long as possible.

Gas masks should be handled with care and should not be thrown about or roughly treated. Heat, moisture and sunlight are enemies of rubber. Therefore, when not in use, gas masks should be stored in cool, dry and dark places.

While ordinarily it is naturally desirable for each operator to have his own personal mask and to be held strictly accountable for its condition, in times like the present it may become necessary on occasions to borrow masks. When that is done it is highly important that the mask should be sterilized before and after use by the different individuals.

We understand that a chemical suitable for sterilizing gas masks is marketed by Alba Pharmaceutical Company, Inc., 74 Laight St., New York, N. Y., under the trade name of ROCCAL. The state ". . . the rubber mouthpiece should be dipped in a RACCAL solution. The solution recommended by the Government Agencies is one part ROCCAL to 250 parts of water. This solution is amply potent to completely sanitize the rubber mouthpiece as well as the fabric in the body of the mask. ROCCAL at a concentration of 1:250 is harmless when used in any sanitizing procedure. In addition, we might say that it is absolutely non-corrosive to metal, paint or any other surfaces."

—*Discoid News Bulletin.*

Restaurant Advice — Boston. — A Boston restaurant advertises: "If your wife can't cook don't divorce her—come here and keep her as a pet."

CORRECTION

The three tables of research findings published on page 14, *September*, '42 *PESTS, in conjunction with Dr. G. C. Sherrard's article, FIVE FUMIGANTS FOR DISINFESTATION OF BEDDING AND CLOTHING: A COMPARATIVE STUDY OF INSECTICIDAL PROPERTIES, were not set in accordance with original copy and should, therefore, be disregarded. Instead the correct tables, which appear below, should be made an integral part of Doctor Sherrard's paper. Our apologies to both Doctor Sherrard and to our readers for any inconvenience or misunderstanding that may have occurred as a result of our inadvertent "bull."*—EDITOR.

TABLE 1.—The minimum lethal concentration and the concentration for a 100 per cent kill of bedbugs by each of five fumigants, in ounces per 1,000 cubic feet, under comparable conditions.

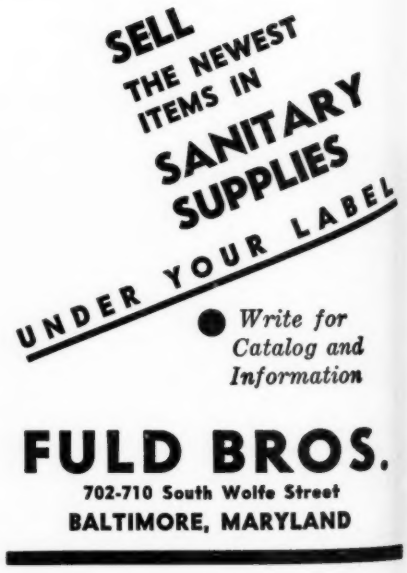
Fumigant	MLC for bedbugs in oz. per 1,000 cu. ft.			Hours of exposure	Fahrenheit temperature range	Concentration required for a 100% kill of bedbugs in oz. per 1,000 cu. ft.		
	Unprotected	Protected by 32 layers of blanket				Unprotected	Protected by 32 layers of blanket	
		Atmospheric pressure	25-inch vacuum				Atmospheric pressure	25-inch vacuum
Hydrocyanic acid	1/6	½	1/5	4	61° to 70°	2	4	2
Chloropicrin	3	4	4	4	65° to 72°	4	6	4
Methyl bromide	4	6	4	4	70° to 72°	6	8	6
Ethylene oxide mixture	80 at 85°	128 at 85°	80	4	80° to 85°	192	256	160
Ethylene dichloride mixture	88	192	128	4	70° to 75°	160	224	192

TABLE 2—The minimum lethal concentration and the concentration for a 100 per cent kill of cockroaches by each of five fumigants, in ounces per 1,000 cubic feet, under comparable conditions.

Fumigant	MLC for cockroaches in oz. per 1,000 cu. ft.			Hours of exposure	Fahrenheit temperature range	Concentration required for a 100% kill of cockroaches in oz. per 1,000 cu. ft.		
	Unprotected	Protected by 32 layers of blanket				Unprotected	Protected by 32 layers of blanket	
		Atmospheric pressure	25-inch vacuum				Atmospheric pressure	25-inch vacuum
Hydrocyanic acid	1/5	½	1/5	4	60°	2	6	2
Chloropicrin	3	4	3	4	65° to 76°	5	6	6
Methyl bromide	3	6	3	4	69° to 72°	5	8	5
Ethylene oxide mixture	80	128	80	4	79° to 85°	160	512	160
Ethylene dichloride mixture	48	64	48	4	63° to 70°	88	160	88

TABLE 3—The minimum lethal concentration of 5 fumigants, in ounces per 1,000 cubic feet, for the destruction of wild rats, under comparable conditions.

Fumigant	MLC for rats in ounces per 1,000 cubic feet (unprotected)	Hours of exposure	Farhenheit temperature range
Hydrocyanic acid	1/5	4	52° to 59°
Chloropicrin	1	4	63°
Methyl bromide	2	4	76° to 79°
Ethylene oxide mixture	80	4	80°
Ethylene dichloride mixture	88	4	73°



Fire Ants Causing Damage to Telephone Equipment

At Galveston, Tex., the Southwestern Bell Telephone Company has been troubled for several years with damage by ants to telephone equipment. The damage recurs each year from May to October. During September, 1939, the telephone company kept a record of the type of trouble in substation equipment. Of 446 cases, 83 were due to ants. The majority of these were in the residential district. The following summary of subscribers' equipment failures caused by ants was taken from the Company's report: Ringer failure, 49 cases; Severed bias string, 14 cases; Switch-hook failure, 11 cases; Protector grounded, 9 cases; a total of 83 reports of failure of equipment.

Three types of damage have been noticed. The chief one seems to be the fouling of working parts by the ants themselves. Second, the ants chew off portions of the insulation on wires, causing short circuits. Third, incidental to nesting in the equipment, the ants introduce bits of lint, fibers, and food particles, which foster excess humidity and consequent corrosion of metal parts.

Damaged telephone equipment and live specimens of these ants were submitted to the Dallas laboratory of the Bureau of Entomology and Plant Quarantine for examination.

In the bell and connection box ants had chewed many small holes through the insulation covering the electromagnets. Moisture (and possibly excretions or secretions of the ants) caused corrosion which resulted in the coil "going open." The insulation was chewed from cords leading to the desk set, as indicated by arrows. In other sets ants crowded between armature and pole pieces of the ringer and were mashed when the bells were rung. In time the accumulation of ants caused ringer failures. Frequently the small string connecting the biasing spring to its adjustment screw was severed, permitting the bells to jangle when the telephone was dialed.

Further trouble was experienced with fouled lightning protectors. The rubber gasket under the brass housing of the carbon arrestor blocks was gnawed through, permitting entry of ants. There was an accumulation of dead ants and particles of foreign matter between the metal contacts holding the arrestor blocks. During humid weather this was sufficiently damp to ground the line.—4-8-40.

Craig Eagleson, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

—*Journal of Economic Entomology.*

War Stimulates Tests of Insect Poisons

Wartime dislocations of the sources of supply of some insecticides has intensified research on substitutes. But some promising substitutes already worked out in laboratories are not on the market because they have not been tested widely enough to warrant commercial production. To cut down this lag, R. C. Roark of the U. S. Department of Agriculture, is now writing a series of mimeographed reports to entomologists—not to the general public—on "Some New or Little Used Insecticides Worthy of Further Testing." The chemicals he mentions are not, as a rule, on the market, and so are not practical even for experimental use by farmers and gardeners. Roark is offering these reminders with the idea that as soon as the chemicals have been tested widely enough, industry will supply the best of them.

Delay in getting insecticides into action is an old story. Derris, says Roark, was mentioned as an insecticide as early as 1848. A 1919 report was favorable. But it did not come into quantity use in the United States until 1931. Now the rotenone insecticides—manufactured mainly from derris—are widely used, and with much of the suppl cut off, the WPB has restricted use of rotenone to the more essential food protection purposes for which there is no substitute. The very fact that shortages now exist will stimulate wide testing of promising substitutes, Roark believes.

In the first papers of this series for entomologists, Roark reminds them of recent research in the Bureau of Entomology and Plant Quarantine that has developed a whole series of copper and arsenic compounds closely related to Paris green. Paris green is made with the aid of acetic acid. By substituting some of the other similar acids, F. E. Dearborn has created related "greens," some more poisonous to certain insects than the original poison. Also in combination with some of the oily acids—from peanut, soybean, tung, and fish oils—the "greens" have been highly effective against some insects.

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TARPAULIN FUMIGATION

Folder discusses: Tarpaulin fumigation for bagged and packaged foods and agriculture seeds; procedure; how to arrange the gas expansion dome; how to cover stock for fumigation, etc.

WRITE PESTS—TARPAULIN-D.

Hydrocyanic Acid Not Cumulative:

Bulletin attempts to answer such questions as: What after-effects result in the case of a person who has been overcome by hydrocyanic acid and is subsequently revived?—Does the gas have any cumulative effect upon a person who unavoidably breathes small quantities of it in the course of his daily work?

WHITE PESTS—AC-61

RODENT CONTROL FOLDER

Instruction sheet which gives data on Larvacide for rats and mice both in warehouses and in outside burrows. It is designed especially for small jobs where a gas mask is not needed, and, of course, gives the dosages and principles for use on any size of rodent job.

WRITE PESTS—Isco

A NEW 76-PAGE "FUMIGATION MANUAL"

Designed as a reference book for the pest control operator, has been published recently.

Fumigation with hydrocyanic acid gas of homes, industrial structures, mushroom houses, museums, railroad equipment, passenger buses, flour mills, candy factories and stores, warehouses and other places where insects cause damage is described in the manual.

Fumigation procedures, the generation of the fumigant, and fumigation in atmospheric and vacuum vaults are detailed. The manual also contains a descriptive list of insects, and references to information on the effects of hydrocyanic acid gas on feeds, fabrics, metals and other commodities, fumigation precautions, first-aid and medical attention, fumigation records and "selling pest control."

WRITE PESTS—ELECTRO.

GAS MASKS

Bulletin advances some practical suggestions for maintenance of gas masks, etc.

WRITE PESTS—AC-62.

MOLE KILLER PELLETS

Circular describes mole killer pellets which manufacturer states requires no traps, no gas, no exposed poison. Diagram of runways and explains how mole lives. Testimonial letters.

WRITE PESTS—Carajon.

ALL PURPOSE GAS MASK

Manufacturer states among its merits are full vision for the user, protection against carbon monoxide and other gases, a long effective life and a harmless chemical reaction that gives warning by odor as soon as protection against carbon monoxide commences to weaken. Folder M401 gives complete description.

WRITE PESTS—Acme.

SULPHUR FUMIGATIONS

Circular gives price list of sulphur candles.

WRITE PESTS—Portage.

WHAT OF MORIBUND KILL?
By Russell B. Stoddard

TEST METHODS FOR RECORDING MORIBUND KILL
By Dr. H. E. Whitmire

Informative brochure which discusses the importance of the so-called Moribund "Kill" as a factor in rating the value and effectiveness of household insecticides and insecticide materials. These two articles correct misapprehensions that may be extant and contribute to the simplification and clarification of the question.

YOUR COPY MAY BE HAD BY ADDRESSING D & O, c/o PESTS.

CARDBOARD WALL CHART

Illustrates some of the common and unusual household pests and also lists antidotes for poisons and highly toxic materials. Quick handy reference chart of unusual merit for all pest control operators.

WRITE PESTS—Opitz.

AGRICULTURAL PRODUCTS

Attractively illustrated folder discussing chemistry in agriculture; jelly ant bait and directions for use on golf greens; gardens and shrubs; household. Mention is also made of an organic turf fungicide and directions for its use. Borerkil for tree boring insects; effective method of borer control and directions for use. Borerkil force gun illustrated. Use as a dog repellent; fumigant for poultry roosts. Formula for nicotine spray also given.

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Entomological Literature

RODENT PESTS OF IOWA AND THEIR CONTROL

By H. Gunderson and G. C. Decker—5-42—Bulletin P43 (New Series) Agricultural Experiment Station, Iowa State College, Ames, Iowa. Discusses control methods of: Ground squirrels, ground hogs or woodchucks, pocket gopher, rats, mice, tree squirrels, rabbits, garden moles.

RAT CONTROL

By G. C. Decker, H. Gunderson and H. J. Barre—October, 1941—Bulletin P33 (New Series)—Agricultural Experiment Station, Iowa State College, Ames, Iowa.

Contents: Life history, rat damage, rat control, poison bait, kinds of poison, kinds of baits, preparation and distribution of baits, prebaiting, antidote for poisons, fumigation, trapping, other methods, making farm buildings rat proof, foundations, floors, walls, corncribs and granaries, livestock structures, recommendations for rat-proofing farm buildings.

INSECT PESTS OF STORED RICE AND THEIR CONTROL

Farmers' Bulletin No. 1906—Issued August, 1942, U. S. Department of Agriculture—By August I. Balzer, Assistant Entomologist, Division of Cereal and Forage Insect Investigations, Bureau of Entomology and Plant Quarantine. For sale by Superintendent of Documents, Washington, D. C. Price 5c (no stamps).

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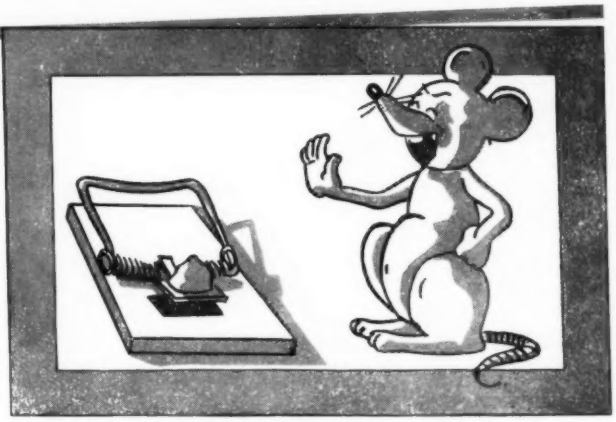

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